ORDER NO. MTC9104412F1
B5

Service Manual

Color Television

Model	Chassis
CTN–1942R	ARDP201
CTN–1955R	ANDP201
CTN–1956R	ANDP201

(GL8H)

Main Manual

CTN–1942R

CTN–1955R, CTN–1956R(Black Cabinet)

The service technician is required to read and follow the "Safety Precautions" and "Important Safety Notice" in this manual.

Specifications

Power Source:	120 volts, 60 Hz, AC
Power Consumption:	1.5 amps max.
Antenna Terminal Impedance:	1–UHF/VHF 75Ω input
Channel Capability:	155 Channel (Phase 14 Modified Synthesizer)
Off the Air:	VHF 2~13, UHF 14~69
Cable:	99 Channels
Sound Output	1.5W (10% distortion)
Anode Voltage	26.5kV +1.0 –1.5kV
Remote Control:	Infra–red system EUR641241 (CTN–1942R) EUR641036 (CTN–1955R, 56R)
Picture Tube:	19" diagonal 90 degree deflection 51GGB95X
Dimensions: (CTN–1942R)	Height – 17" (432mm) Width – 22–1/8" (562mm) Depth – 18–1/2" (470mm)
Weight:	43.5 lbs. (19.73kg)
Dimensions: (CTN–1955R, 56R)	Height – 17–5/8" (448mm) Width – 19–3/4" (502mm) Depth – 18–7/8" (479mm)
Weight:	39.5 lbs. (17.92kg)

Specifications are subject to change without notice or obligation.
Dimensions and weight are approximate measurements.

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Important Safety Notice

There are special components used in this television set which are important for safety. These parts are "BOXED" on the schematic diagram and printed in **BOLD TYPE** on the replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent X–RADIATION, shock, fire or other hazards. Do not modify the original design without the permission of manufacturer.

Safety Precautions

General Guidelines

An ISOLATION TRANSFORMER should always be used during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

When servicing observe the original lead dress, especially in the high voltage circuit. In case of a short circuit, replace every part which has overheated.

Always REPLACE PROTECTIVE DEVICES, such as fishpaper, isolation resistors and capacitors and shields after working on the receiver. Use only manufacturers recommended rating for fuses, circuit breakers, etc.

High potentials are present when this set is operating. Operation of the set without the rear cover involves the danger of electric shock from the set's power supply. Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high–voltage equipment.

Extreme care should be used in HANDLING THE PICTURE TUBE. Rough handling may cause it to implode due to atmospheric pressure (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure in removal or installation. When handling, use safety goggles and heavy gloves for protection. Discharge picture tube by shorting the anode connection to chassis ground (not cabinet or other mounting parts). When discharging, go from cold ground (i.e. dag ground lead) to anode with a well insulated piece of wire.

Avoid prolonged exposure at close range to unshielded areas of the picture tube. Possible danger of personal injury from unnecessary exposure to X–ray radiation may result.

The TEST PICTURE TUBE used for servicing the chassis at the bench should incorporate a safety glass and magnetic shield. The safety glass affords shielding from the tube viewing area against X–ray radiation as well as implosion protection. The magnetic shield limits X–ray radiation around the bell of the picture tube in addition to restricting magnetic effects. When using a picture tube test jig for service, ensure that jig is capable of handling 31kV without causing X–radiation.

BEFORE RETURNING A SERVICED RECEIVER **(of any type)** TO THE OWNER, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock. DO NOT USE A LINE ISOLATION TRANSFORMER WHEN MAKING THIS TEST.

Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and each exposed metallic part such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. When the exposed metal does not have a return path to the chassis, the reading must be infinite.

Leakage Current Hot Check (See Figure)

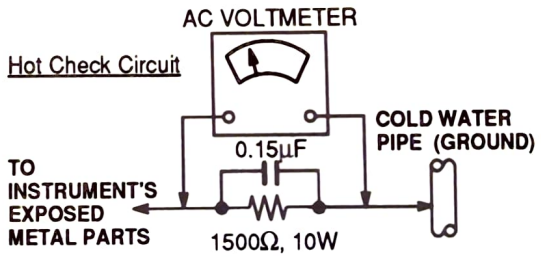
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15µF capacitor between each exposed metallic part and ground. Use an earth ground, for example a water pipe.

Using an AC voltmeter with 1000 ohms/volt or more sensitivity, measure the potential across the resistor.

Move the resistor connection to each exposed metallic part and measure the voltage present.

Check that any potential does not exceed 0.75 volt RMS. A leakage current tester (Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above hot check, in which case any current measure must not exceed 1/2 milliamp. In case any measurement is out of the limits specified, there is a possibility of a shock hazard and the set must be repaired and rechecked before it is returned to the customer.



X–Radiation

WARNING: The potential source of X–radiation in TV sets is the High Voltage section and the picture tube.

NOTE: It is important to use an accurate, periodically calibrated high voltage meter.

Adjust BRIGHTNESS, PICTURE, SHARPNESS and COLOR controls to Minimum.

Measure the High Voltage. The high voltage meter should indicate 26.5kV (+1.0kV, –1.5kV), 29.0kV (+1.0kV, –1.5kV Canadian Models). If the upper meter indication is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal Osc. Disable Circuit Test

This test must be made as a final check before the set is returned to the customer. See HORIZONTAL OSC. DISABLE CIRCUIT PROCEDURE CHECK in this manual.

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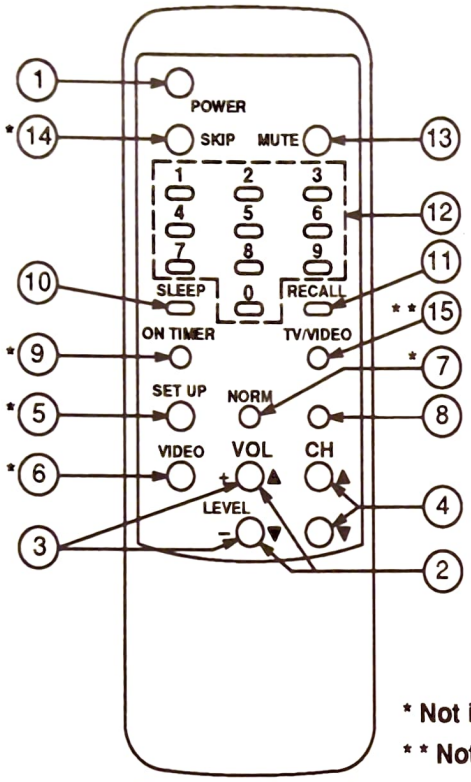
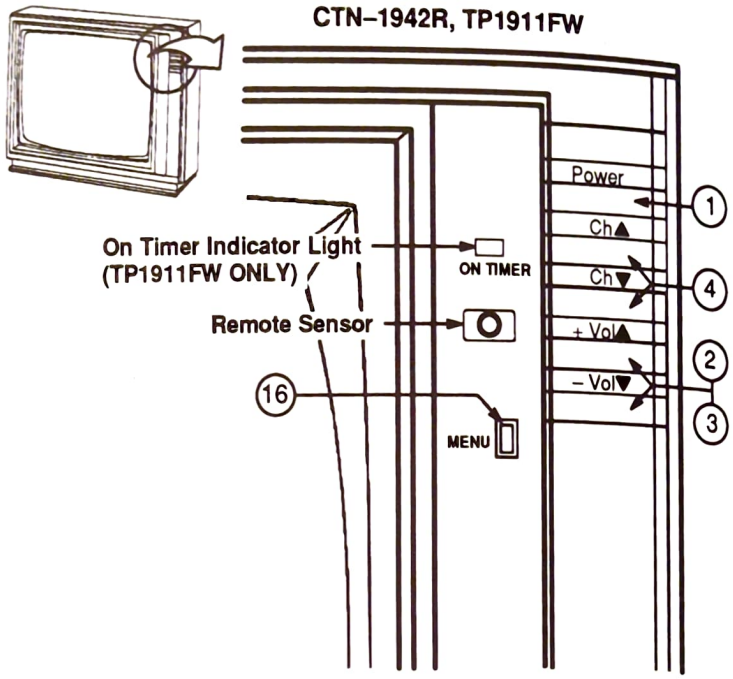
Location of Controls



Remote Control

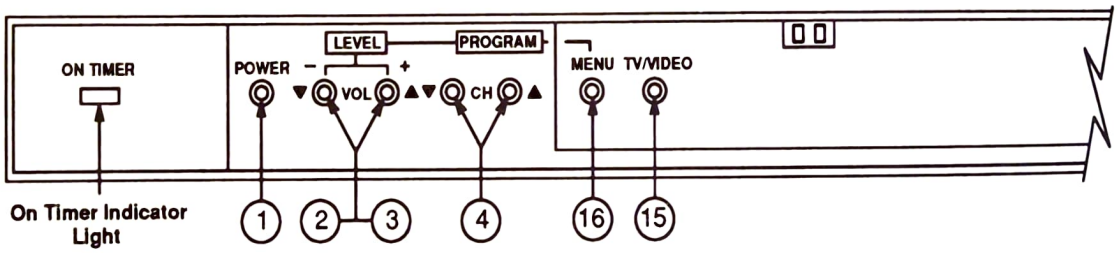
CTN–1942R, TP1911FW



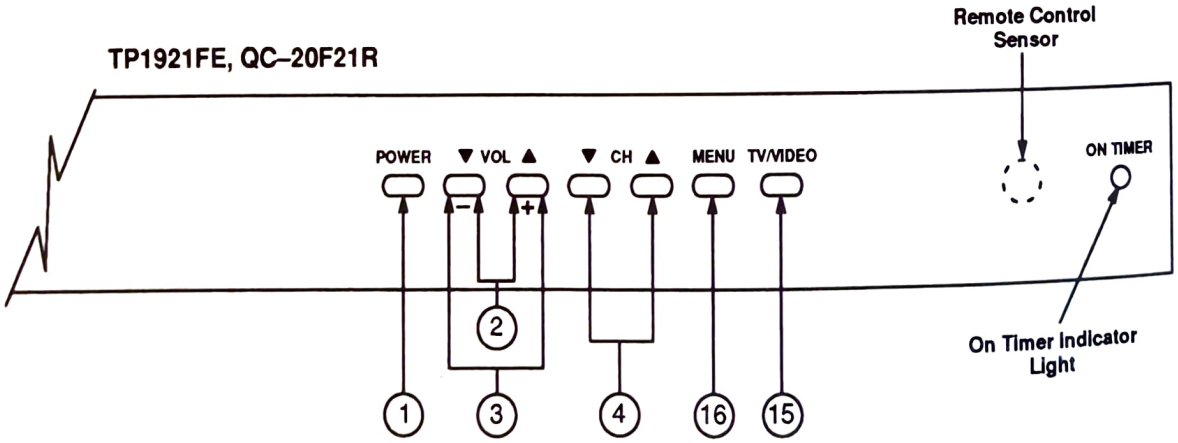
* Not in CTN–1942R

* * Not in CTN–1942R, TP1911FW

CTN–1955R, CTN–1956R, PC–20X56R



TP1921FE, QC–20F21R



Quick Reference Control Operation

(1) **Power Button** – Press to turn ON. Press again to turn OFF.

(2) **Volume Buttons** – Press VOLUME (VOL) ▲ button to increase sound level. Press VOLUME (VOL) ▼ button to decrease sound level.

(3) **Level (+) and (–) Buttons** – Press to adjust Video, Set Up and On Timer Menus, when displayed.

(4) **Channel Buttons** – Press CHANNEL (CH) ▲ button to select the next higher programmed channel. Press CHANNEL (CH) ▼ button to select the next lower programmed channel.

(5) **Set Up Button** – Press the SET UP button to display Set Up Menus:
- Initiate Auto Channel Programming
- Program Channel Memory
- Select TV/ANT or Cable Tuning System
- Set Clock

(6) **Video Button** – Press the VIDEO button to display Video Adjustment Menus. Use to adjust Color, Tint, Brightness, Picture, and Sharpness.

(7) **Norm (Normalize) Button** – Press the NORM (NORMALIZE) button while any Video Adjustment Menu is displayed. Adjustments will automatically set to a factory preset level.

(8) **Last Channel Viewed Feature** – Press to alternately switch between the last two channels selected.

(9) **On Timer Button** – Press to display On Timer Menu. This feature allows turn ON at a predetermined time and channel.

(10) **Sleep Button** – Press the SLEEP button to select automatic turn OFF in 30, 60 or 90 minutes.

(11) **Recall Button** – Press the RECALL button to display:
- Time of Day (if clock is set) or status of Sleep Timer
- Channel number or Video Mode

(12) **Channel Keyboard "0" through "9" Buttons** – Press desired channel number to access any programmed or unprogrammed channel.

(13) **Mute Button** – Press MUTE button to mute sound. A second press will return sound to its previous level.

(14) **Skip Button** – Press the SKIP button to choose 30, 60 or 90 seconds, then select any other channel(s) or video. When the time elapses you will automatically return to the original channel.

(15) **TV/Video Button** – Press the TV/VIDEO button to select TV or Video Input Mode of operation.

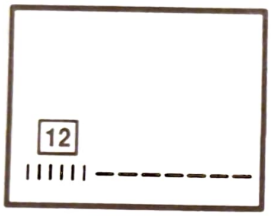
(16) **Menu Button** – Press the MENU button to access both Video and Set Up Menus.

Control Operation

① Power Button

Press the POWER button to turn ON. Press again to turn OFF. Channel (or Video Mode) and volume level will be the same as when last turned off. Channel number and time (when clock is set) will display when first turned on.

② Volume Buttons



Press VOLUME ▲ to increase volume or press VOLUME ▼ to decrease volume. An On–Screen display will indicate volume level.

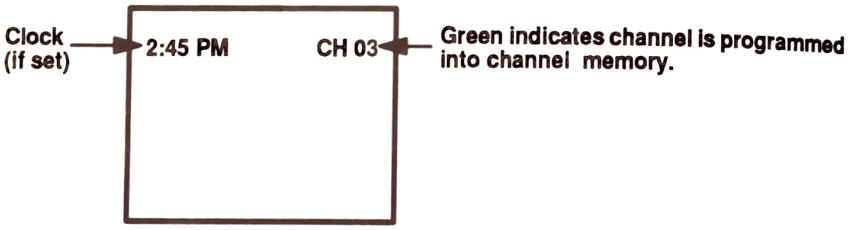
NOTE: The VOLUME buttons also serve as LEVEL buttons when certain menus are displayed.

③ Level (+) and (–) Buttons

The LEVEL buttons are used in conjunction with the Video, Set Up and On Timer Menus. Once a display is On Screen the LEVEL (+) and (–) buttons are used to make the desired adjustment.

④ Channel Buttons

Press CHANNEL ▲ or ▼ to sequentially select only those channels programmed in memory. Channel number and time (when clock is set) will display for each channel selected.

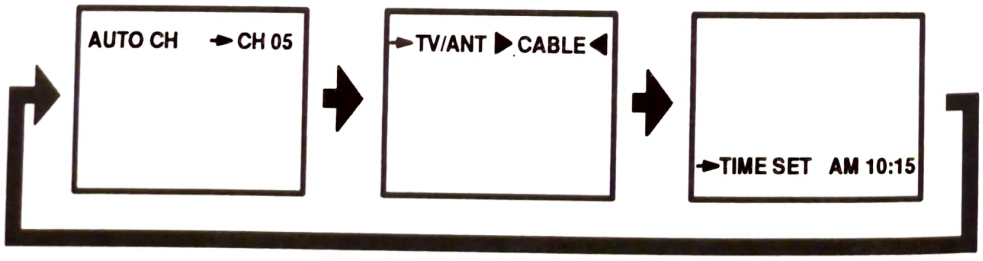


- The TV/Video Video Switch must be set to the TV position. (Not applicable to CTN–1942R, TP1911FW).
- The TV/ANT–CABLE Menu must be set for the type of signal at the antenna input. Select TV/ANT for off air signals or CABLE for cable signals.
- All channels will be available when there are no channels programmed in memory (indicated by Yellow channel numbers).
- Only programmed channels will be tuned when two or more channels are programmed in memory (indicated by Green channel numbers).
- Non–programmed channels can be tuned with the Remote Control Channel Keyboard "0"–"9" buttons.

⑤ Set Up Button (Not in CTN–1942R)

The SET UP button is used to display a number of On Screen Set Up Menus that allow the viewer to select the following features:

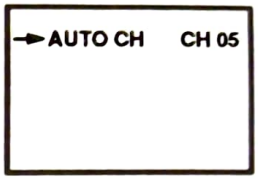
- Auto Channel Programming
- Program Channel Memory
- Select TV/ANT or Cable Tuning System
- Set Clock



NOTE: Prolonged power interruption will result in the loss of Set Up feature adjustments.

Auto Channel Programming

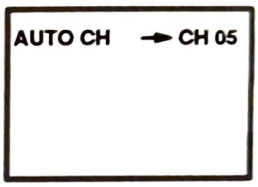
This feature automatically scans through all TV channels in the TV/ANT Broadcast System or CABLE Transmission System. It will add to channel memory any channel with a signal present. The channel numbers will be displayed in Green. Make sure TV/ANT–CABLE Menu is set properly for the TV signal system you have.



1. Press SET UP button. A Set Up Menu will display On Screen.
2. Press the SET UP button repeatedly until the arrow points to AUTO CH.
3. Press LEVEL (+) button. Auto channel programming feature starts. To defeat once started, press ANY OTHER button and the feature stops with all previous added channels programmed into channel memory.

Add/Erase Channels From Memory

- Make sure TV/ANT–CABLE Menu is set properly for the TV signal system you have.
- Channels added to memory will tune when using CHANNEL ▲ or CHANNEL ▼ button.
- Channels erased from memory will be skipped when using CHANNEL ▲ or CHANNEL ▼ buttons.

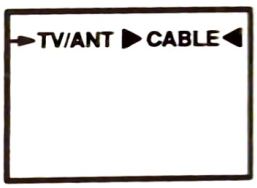


1. Press SET UP button. A SET UP Menu will display On Screen.
2. Press SET UP button repeatedly until the arrow points at channel number display.
3. Select a preferred channel while the menu is On Screen. Use CHANNEL▼/▲ button or use Channel Keyboard.

   NOTE: A channel displayed in Yellow indicates the channel is not programmed into channel memory. A channel displayed in Green indicates the channel is programmed into channel memory.
4. Press LEVEL (+) button to ADD a channel when channel number is displayed in Yellow.
5. Press LEVEL (–) button to ERASE a channel when channel number is displayed in Green.

TV/ANT–Cable Tuning

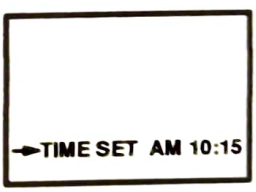
This feature allows the viewer to choose the proper tuning system for the type of signal at the antenna input.



1. Press SET UP button repeatedly until the TV/ANT–CABLE Menu appears.
2. Press LEVEL (+) or (–) button to activate the proper tuning system. The selected tuning system will appear in Red.

- TV/ANT is used when not connected to a Cable TV System, for example, when using a VHF/UHF antenna (Channels 02–69).
- CABLE is used when connected to a Cable TV System and you are not using a cable company converter box (Channels 01–99).
- Some Cable TV Systems encode (scramble) program material on specific channels. A cable company supplied decoder is required to reproduce an acceptable picture.
- Certain Cable TV Systems severely offset some channels to reduce interference. It will be necessary to use the cable company supplied converter to receive these specific channels.

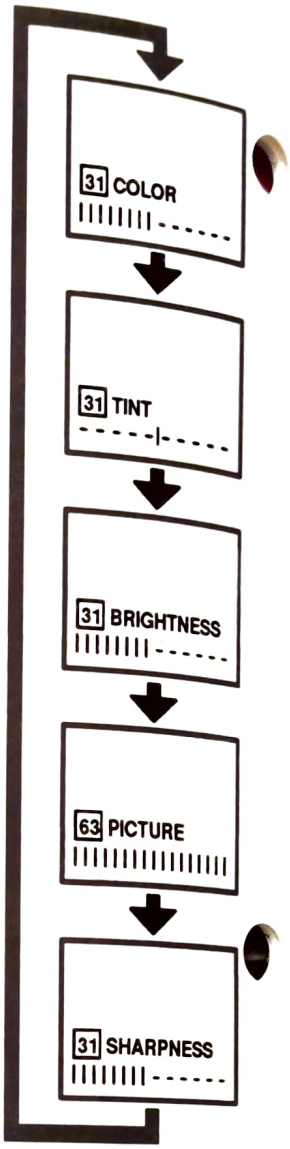
Setting Clock Time



1. Press SET UP button repeatedly until TIME SET Menu appears and CLOCK HOURS position is in Red.
2. Press LEVEL (+) button to advance hours. Press LEVEL (–) button to reverse hours. Set AM or PM hours accordingly.
3. Press SET UP button again. CLOCK MINUTES position is in Red. Press LEVEL (+) button to advance minutes. Press LEVEL (–) button to reverse minutes.

⑥ Video Button (Not in CTN–1942R)

- COLOR – adjust for desired color intensity.
- TINT – adjust for natural flesh tones.
- BRIGHTNESS – adjust so that dark areas of picture just become black for a crisp detail.
- PICTURE – adjust whitest parts of picture to your preference.
- SHARPNESS – adjust for best clarity of outline detail and/or to reduce effects of noise interference in picture.



To Adjust

1. Press VIDEO button to display a Video Menu.
2. Each additional press of the VIDEO button will select a different video function.
3. Press or Hold LEVEL (+) or (–) button to adjust function. Adjustment scale and setting indicator number will display On Screen. Use to establish a desired level.

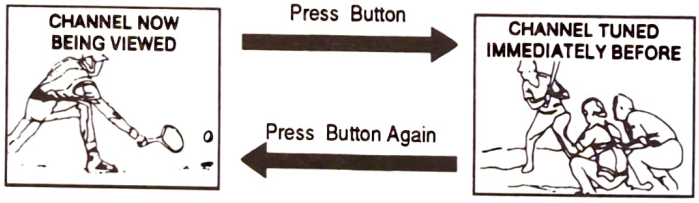
NOTE: Press – adjustment is made in small increments with each press.
Hold – adjustment is continuous until button is released.

4. Adjust each function to your own preference or you may select a factory preset level by pressing NORM (NORMALIZE) button while any of the Video Adjustment Menus are displayed.

⑦ Norm (Normalize) Button (Not in CTN–1942R)

Press the NORM (NORMALIZE) button while any Video Adjustment Menu is displayed. Adjustments will automatically set to a factory preset level.

⑧ Last Channel Viewed Feature



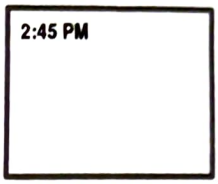
This feature allows the viewer to switch between the current channel and the last channel viewed. The switching is instantaneous without passing through any intermediate channels and no On Screen displays are activated.

- This feature will not operate if the same channel number is entered twice in succession.

⑨ On Timer Button (Not in CTN–1942R)

Press the ON TIMER button to view status of the On Timer Menu. This menu may be programmed for any turn on time and channel within a 24 hour period.

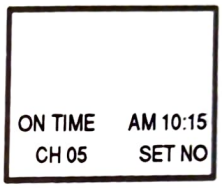
IMPORTANT NOTE: CLOCK MUST FIRST BE SET BEFORE THIS FEATURE CAN BE USED. Clock setting can be confirmed when the time display appears on screen during initial turn on or channel change.



To Program On Timer Menu:

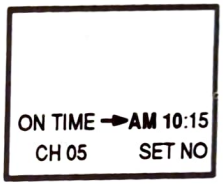
1. Press ON TIMER button to display On Timer Menu.

1.



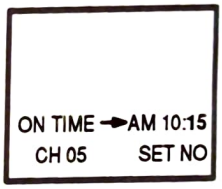
2. Press ON TIMER button repeatedly to advance cursor (→) to ON TIME hours position and it will display in Red. Use LEVEL (+) or (–) button to set hours AM or PM.

2.



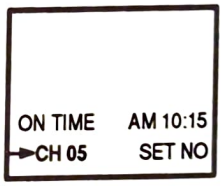
3. Press the ON TIMER button to advance to MINUTES position and it will display in Red. Set minutes with the use of LEVEL (+) or (–) button.

3.



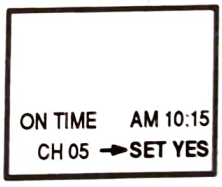
4. Press ON TIMER button to advance cursor to CH position and it will display in Red. Press LEVEL (+) or (–) button until the desired channel number is displayed. (Only channels programmed into Channel Memory are available.)

4.



5. Press ON TIMER button to advance cursor to SET position. Each press of LEVEL (+) or (–) button selects YES or NO. Select YES if you want to activate the ON TIMER feature (On Timer indicator will light). Select NO if you do not want to activate the ON TIMER feature.

5.



Special Conditions Affecting On Timer

- ON TIMER feature must be reset each time it is desired.
- After initial turn ON by the ON TIMER feature, turn OFF will automatically occur in 90 minutes unless a function button is pressed.
- Turn ON prior to ON TIMER feature activation will cause the channel designated by the On Timer Menu to be tuned at the programmed time.

⑩ Sleep Button

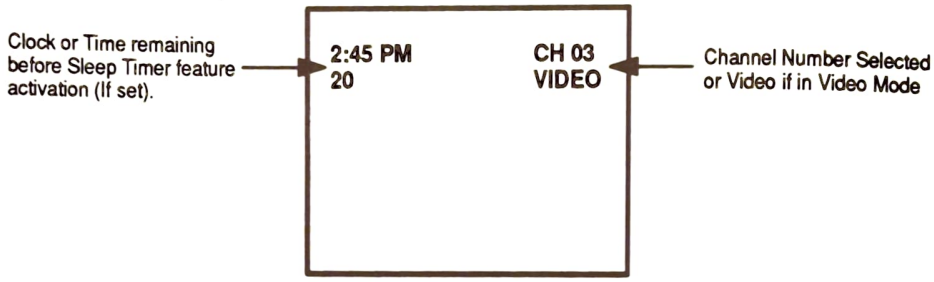
This feature automatically shuts off power after a predetermined time lapse of 30, 60 or 90 minutes.

1. Press the SLEEP button once to set the Sleep Timer for 30 minutes as displayed On Screen.
2. Press the SLEEP button twice to set the Sleep Timer for 60 minutes as displayed On Screen.
3. Press the SLEEP button three times to set the Sleep Timer for 90 minutes as displayed On Screen.
4. Press SLEEP button continuously until the display reads 0, to deactivate the Sleep Timer.

- Display will flash 3, 2 and 1 to indicate the last three remaining minutes prior to turn off. This allows the viewer to reset or deactivate this function before shut off.
- After Sleep Timer is set, use the RECALL button to find out the time that remains prior to automatic turn off. A press of the SLEEP button while Sleep Timer function is active will reset the timer clock to the next higher 30 minute interval.

⑪ Recall Button

A press of this button will display the following:


Clock or Time remaining before Sleep Timer feature activation (If set).
2:45 PM
20
CH 03
VIDEO
Channel Number Selected or Video if in Video Mode

⑫ Channel Keyboard "0" through "9" Buttons

Press two keys to access any programmed or unprogrammed channel. (Example: "0" and "5" for channel 5).

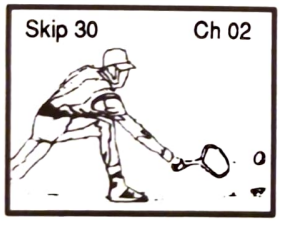
- Second number must be pressed within 2 seconds of the first entry or channel will change to that of the first number entered.
- The current channel will remain on when an invalid channel number is entered. (Example: Channel 70 while in the TV/ANT mode).
- RECALL button may be used at anytime to display the current channel.
- The TV/VIDEO button must be set to the TV position.

⑬ Mute Button

Press MUTE button to mute sound immediately. "MUTE" will display for a few seconds. Press again and sound will be restored to same level as before muting. Display of volume level adjustment will appear.

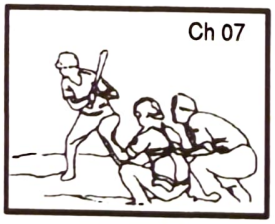
⑭ Skip Button (Not in CTN–1942R)

This feature allows the viewer to temporarily select other channels or Video Mode and automatically returns to the original channel after a predetermined time period.

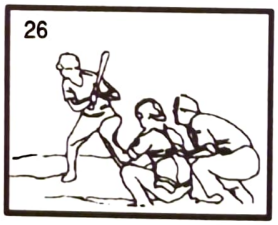


1. Press SKIP button.

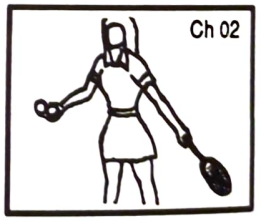
Once for 30 seconds.
Twice for 60 seconds.
Three times for 90 seconds.
Four times to deactivate feature.



2. Select any other channel(s) or Video Mode.



3. Channel number disappears, then Skip Timer will appear and count down.

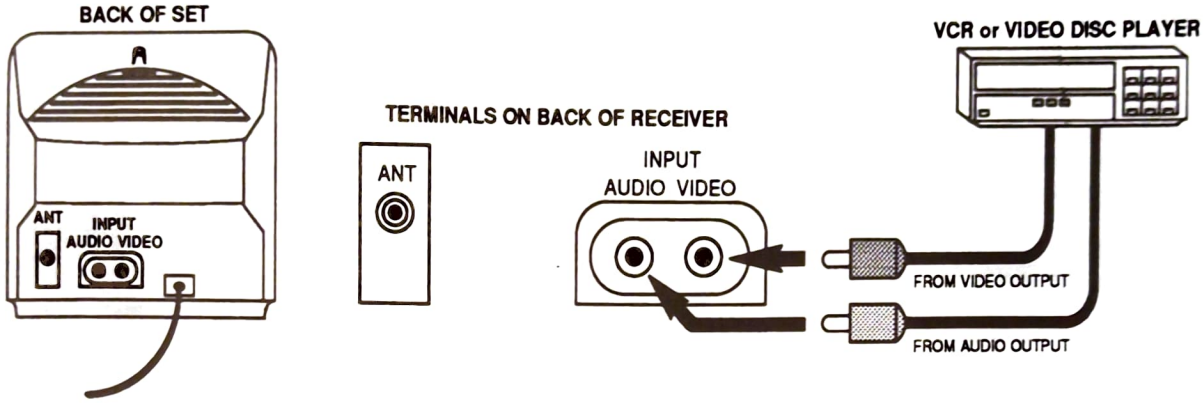


4. Automatically returns to original channel when time elapses.

⑮ TV/Video Button (Not in CTN–1942R, TP1911FW)

Each press of TV/VIDEO button, alternately switches between TV and Video Modes. (Equipment connected to input jacks).

- TV (CH and channel number display On Screen) normal TV operation.
- VIDEO (VIDEO will display On Screen) used when optional accessory video equipment (such as VCR, VIDEO DISC player, etc.) is connected to the INPUT JACKS on back of set.



NOTE: Connect the Optional Equipment as shown, if your Optional Equipment is Stereo, place Optional Equipment in Monaural mode and use either left or right Audio Output Jack.

Terminal (RCA)	Level	Impedance
INPUT – VIDEO	1V p–p	75 ohms
INPUT – AUDIO	500mV rms for max output	More than 10K

⑯ Menu Button

The MENU button will allow the viewer to access all Video and Set Up Menus.

Press MENU button repeatedly to display:

The Video Menus

- Color
- Tint
- Brightness
- Picture
- Sharpness

The Set Up Menus

- Auto Channel Programming
- Program Channel Memory
- TV/ANT–Cable Selection Menu
- Set Clock

Use the LEVEL (+) and (–) buttons to adjust or activate features as desired.

Disassembly For Service

Back Cover

1. Remove all screws indicated by ◄ on back of set.

A–Board

1. Push securing plastic clip and slide chassis completely out.
   NOTE: Some tie–wraps securing wire dressings may have to be unfastened for chassis removal.
2. Stand chassis upright using right side of chassis bracket as base. Now underside is completely accessible for component removal.

C–Board

1. Plugs into socket on CRT neck.

L–Board

1. Secured to cabinet front by plastic clips. Use small screwdriver to gently lift clips and pull board out.

R–Board

1. Secured to cabinet front by plastic clips. Use small screwdriver to gently lift clips and pull board out.

Disassembly for CRT Replacement

1. Discharge CRT as instructed in Safety Precautions.
2. Disconnect yoke plug, degaussing coil plug from main board and CRT 2nd anode button.
3. Remove C–Board from CRT base and unplug black wire (CRT dag ground) from board.
4. Slide main chassis assembly completely out. Remove with CRT Board and audio transformer (when applicable).

CRT Replacement

1. Perform DISASSEMBLY FOR CRT REPLACEMENT procedure.
2. Insure CRT H.V. anode button is discharged before handling CRT. See SAFETY PRECAUTIONS on handling the picture tube.
3. Remove components on CRT neck and place cabinet face down on a soft pad.
4. Remove CRT mounting bolts from each corner and remove CRT with degaussing coil and dag ground braid attached.
5. Note original location and mounting of degaussing coil and dag ground assembly to insure proper re–installation on the replacement CRT.
6. To remove degaussing coil cut 4 plastic ties that retain degaussing coil to CRT mounting ears. Four replacement ties are required when degaussing coil is mounted in replacement CRT.
7. Remove dag ground braid by unhooking coil spring from lower left CRT bracket and remove braid loop from upper right corner bracket.
8. Mount dag ground braid and degaussing coil on replacement CRT. Mount replacement CRT in cabinet.

Service Notes

IMPORTANT: To protect against possible damage to solid state devices due to arcing or static discharge, make certain all ground wires and CRT DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing to avoid damage to test equipment or chassis. Connect test equipment to correct ground (⏚) or (⏚) when servicing or incorrect readings will occur.

WARNING: This Receiver has been designed to meet or exceed applicable safety and X-radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-radiation and shock and fire hazard, the parts shown in the 'BOXED' areas of the schematic must be replaced with identical replacement parts. Order parts from the manufacturer's parts center using numbers shown in this service manual or give complete chassis number and part reference number.

For optimum performance and reliability, all other parts should be replaced with components having identical specifications.

Horiz Osc Disable Circuit

This chassis employs a special circuit to protect against excessive high voltage and beam current. If for any reason the high voltage and beam current exceed a predetermined amount, this circuit operates and detunes the horizontal oscillator. This limits high voltage.

The over-voltage protection circuit is not adjustable. However, if components in the 'BOXED' areas of the schematic in either the horizontal sweep system or the over-voltage protection circuit itself are changed the operation of the circuit should be checked using the following procedure.

Equipment needed to check disable circuit:

1. Accurate voltmeter (0 – 200V scale)
2. High Voltage Meter (0 – 40kV)
3. Variac and Isolation Transformer

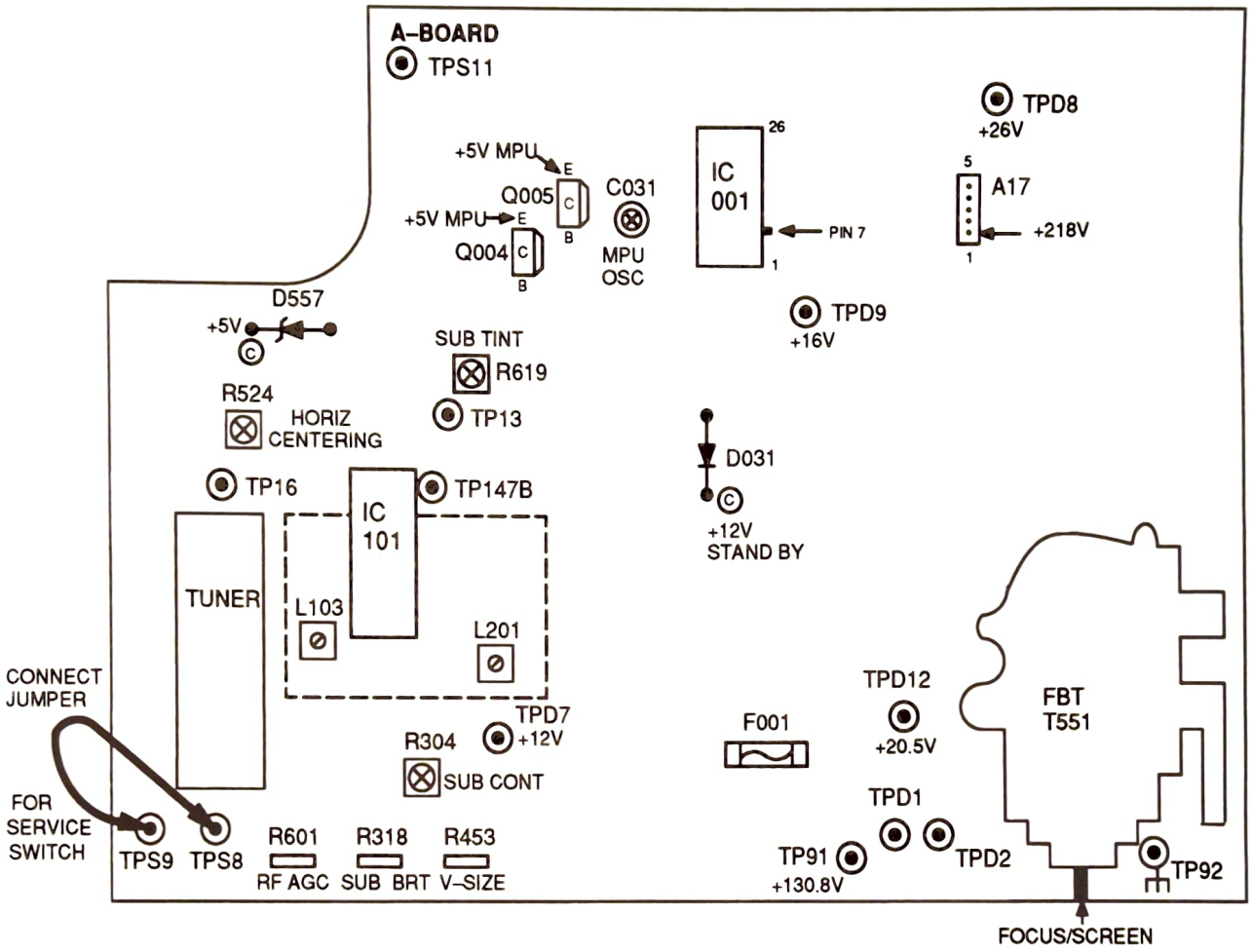
Procedure

1. Tune in a station to verify horizontal is in sync.
2. Obtain Monoscope pattern.
3. Connect voltmeter (+) to TPD2 and (–) to TPD1. Normalize VIDEO control menu. Adjust BRITE to (0) and PICTURE for 0.9 volt reading on voltmeter.
4. Turn Receiver OFF. Connect jumper across R802 (180Ω, 15W).
5. Reduce AC supply voltage to approx. 90V. Connect high voltage meter to CRT 2nd anode (H.V. button). **NOTE:** Use (⏚) ground for minus (–) lead connection of meter.
6. Turn Receiver ON. Slowly raise AC supply voltage and confirm that high voltage does not exceed 31.4kV (33kV Canadian Models) when horizontal just begins to pull out of sync and sound mutes. If high voltage is not within the specified limit, the cause must be determined before the Receiver is returned to the customer. (SEE NEW CIRCUIT SECTION).

Service Adjustment Procedures

ALL SERVICE CONTROLS ARE FACTORY PRESET AND SHOULD NOT REQUIRE ADJUSTMENT UNLESS CONTROL AND/OR ASSOCIATED COMPONENTS ARE REPLACED.
NOTE: CONNECT MINUS LEAD OF VOLTMETER TO CORRECT GROUND FOR CIRCUIT BEING CHECKED. WHEN NECESSARY TO USE A LINE OPERATED GROUND, THE GROUND INDICATION (⏚) WILL BE INDICATED. FOR THIS GROUND, USE TP92. FOR ALL OTHER CIRCUITS, CONNECT MINUS LEAD OF VOLTMETER TO LINE ISOLATED GROUND (⏚) IF SHIELD, IC451 HEAT SINK OR TPB3.

Main Board Service Test Points



130.8V B+ Voltage Confirmation

1. Set BRIGHT, PICTURE and COLOR of Video Menu to Minimum.
2. Connect a DVM between TP91 and ground (⏚) TP92.
3. Confirm that B+ voltage is 130.8V ±1V. This voltage supplies B+ to Horizontal & Flyback circuits.

Source Voltage Chart

120V AC line input. BRIGHT and PICTURE of Video Menu to Minimum. Use isolated ground (⏚) for minus lead of DVM. These voltages are supplied by flyback transformer T551.

TPD7	+12.0V ±1V
TPD9	+16.5V ±2V
TPD8	+26.0V ±2V
TPD12	+20.5V ±2V
Plug A17 (Pin 1)	+200V ±15V
	+220V ±15V (Canadian Models)

+5V Source Voltage

Cathode D557 (Tuner BP)
Emitter Q004 (MPU, VDD ports– IC001)
Emitter Q005 (MPU, Function buttons, Remote Receiver)

+10V Standby B+

Cathode D031 (On–Off relay, Timer L.E.D., IC101 Pin 9–Horiz Osc, Q004 – +5V regulator).

High Voltage Check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Confirm B+ 130.8V is within limit.
3. Using a calibrated high voltage meter confirm that High Voltage is 26.5kV (+1.0kV, –1.5kV), 29.0kV (+1.0kV, –1.5kV Canadian Models).

RF AGC Delay R106

Adjust only if overloading on strong signal or busy background (snow) is present on moderate strength signals.

1. Adjust RF AGC control R106 until snow appears in picture, then adjust control until snow is eliminated.
2. Check all channels for optimum setting.

AFC Field Adjustment L103

1. Select TV/ANT tuning system.
2. Defeat AFC by applying jumper from TPS11 to ground (⏚).
3. Connect a digital voltmeter to AFC test point TP16. (Connect – lead to ground).
4. Check all active High Band channels 7~13 for AFC voltage range. Select channel with AFC voltage in approximate center of voltage range.
5. Adjust L103 for 4.5V ±0.5V at TP16.
6. Remove jumper in Step 2. Check all active channels for proper AFC correction. Touch up L103 if required.

NOTE: Do not use TV/CABLE channel with offset carriers for adjustment or in determination of low and high range of AFC voltage.

Sound Alignment L201

1. Select active TV channel.
2. Attenuate signal (loosely couple antenna lead or use RF attenuator pad) for noisy sound.
   - Adjust L201 for Maximum sound. Signal to noise ratio is best when L201 is peaked.
3. Connect antenna or remove RF attenuator for strong signal.

Sub–Brightness Control R318

Adjustment of this control is important for getting proper operation of brightness and picture controls. This adjustment must be made after Sub–Contrast or Color Temperature adjustments are made. **Do not adjust** SCREEN control after Sub–Brightness is set.

Preparation

Connect a color bar signal with 100 IRE white and 7.5 IRE black. Operate television for a minimum of 10 minutes prior to the adjustment.

Procedure

1. Normalize the VIDEO MENU controls – PICTURE (63), TINT (31), BRIGHTNESS (31) and SHARPNESS (31).
2. Adjust COLOR to Minimum.
3. Increase SUB–BRIGHTNESS control R318 so black bar starts to look grey. Then decrease SUB–BRIGHTNESS to the point where grey turns to black.
4. Adjust COLOR for normal viewing and check all active channels for good brightness level.

Video Level R114

CAUTION: Do not adjust unless control has been replaced or control was accidentally misadjusted.

Preparation

Obtain an NTSC color bar pattern with 100 IRE white and 87.5% modulation.

Procedure

1. Connect oscilloscope to cathode of D3103. Use cold ground for scope connection. Set scope at Horizontal time base.
2. Adjust R114 for 2Volt p–p from sync tip to white level. See detail.
3. Set Sub–Contrast adjustment.

Sub Contrast R304

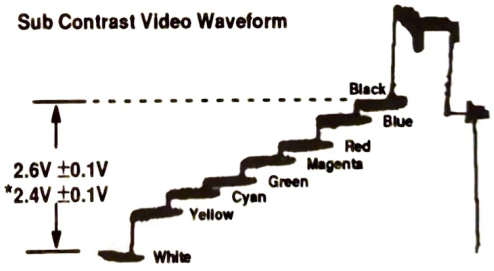
This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or the CRT is replaced.

Preparation

- Obtain a pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black. **NOTE:** The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to your pattern used.

1. Connect signal (pattern as described above).
2. Connect oscilloscope to TP13. Set scope horizontal time base to 20µs (horizontal).
3. Connect a 4.7K ohm jumper from TPD7 to TPD1.
4. Set VIDEO MENU controls to be Normalized.

Sub Contrast Video Waveform

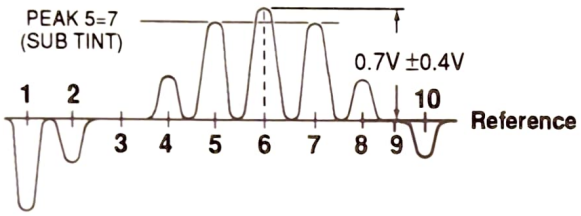


*Canadian Models

5. Adjust SUB–CONTRAST control R304 for 2.6V ±0.1V (2.4V ±0.1V Canadian Models) from white level to black level on video waveform (see video waveform detail).
6. Remove jumper (Step 3).

Color Adjustment R619

1. Apply rainbow color bar signal.
2. Set customer controls
   - Set COLOR, TINT and SHARPNESS to mid range (31). Adjust BRIGHTNESS to Minimum (0). Adjust PICTURE until raster just appears dark.
   - Connect 4.7K resistor jumper between TPD7 (+12V) and TPD1.
3. Connect Oscilloscope to TP47B.
4. Adjust SUB TINT (R619) so peak of color bar 6 equals 0.7V and peaks of color bars 5 and 7 are of the same magnitude as shown in detail.



Color Temperature Adjustment (B/W Tracking)

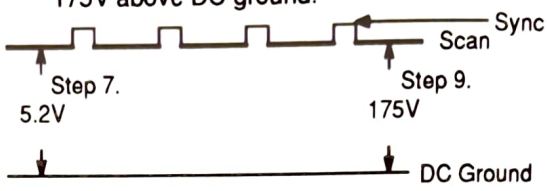
Minor Touch–Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good grey scale and warm highlights".

- LOW LIGHT areas – adjust LOW LIGHT controls (R354, R355, R356) for grey.
- HIGH LIGHT areas – adjust DRIVE controls (R357, R358) for warm whites.

Complete Adjustment

1. Turn Receiver ON and allow 10 minutes warm up at high brightness.
2. Select active TV channel, B/W program if available.
3. Normalize the VIDEO MENU controls – PICTURE (63), TINT (31), BRIGHTNESS (31) and SHARPNESS (31).
4. Adjust COLOR to Minimum.
5. On CRT board adjust COLOR LOW LIGHT controls (R354, R355, R356) and COLOR DRIVE controls (R357, R358) to midpoint.
6. Collapse vert to a horizontal line by applying jumper between TPS8 and ground (⏚) TPS9 and turn SCREEN control to Minimum (counterclockwise).
7. Connect oscilloscope to TP13. Observe waveform at Horiz. rate and adjust SUB BRIGHT (R318) to set scan of waveform 5.2V above DC ground. (Shown in detail).
8. Connect Oscilloscope to Green Cathode (KG) on CRT socket.
9. View trace at horizontal rate and adjust GREEN LOW LIGHT control (R356) to set scan of waveform 175V above DC ground.



10. Connect scope to Red Cathode (KR) and adjust its waveform scan period 175V above ground with RED LOW LIGHT control (R354).
11. Connect scope to Blue Cathode (KB) and adjust its waveform scan period 175V above ground with BLUE LOW LIGHT control (R355).
12. Increase SCREEN control (Clockwise) until a color horizontal line just appears.
13. With the other two colors LOW LIGHT controls, advance each to create a white horizontal line.
14. Remove jumper in Step 6.
15. Adjust BRITE and PICTURE to Maximum and adjust DRIVE controls for warm white.
16. Adjust BRITE and PICTURE to low level brightness and recheck for low level grey scale. Adjust LOW LIGHTS if necessary.
17. Perform SUB–BRIGHTNESS adjustment.

Vertical Size R453

1. Turn VERTICAL SIZE control R453 CCW until top and bottom edges of raster are visible.
2. Adjust VERTICAL SIZE control CW until top and bottom of raster touch bezel edge. Advance SIZE control CW an additional 30 degrees. This will be approximately 10% overscan. Linearity adjustment is automatic with size adjustment.

Horizontal Centering R524

1. Connect crosshatch generator to the antenna terminals.
   a. Set VIDEO menu for Normalize.
2. Set H–CENTER (R524) so center square of crosshatch pattern is centered on CRT screen.

Focus (Part of T551)

Adjust the FOCUS control to obtain the sharpest and clearest picture.

MPU Reference Oscillator C031

1. Connect frequency counter from TPS1 (A3–4) to ground (⏚).

NOTE: Frequency counter probe capacitance should be 8PF or less.

2. Set TV/CABLE switch to TV position. Short TPS2 (IC001, Pin 7) to ground.
3. Select channel 13 and adjust trimmer capacitor C031 for 500KHz ±3.5Hz.

Purity and Convergence Procedure

Adjustment should be necessary only if the CRT or deflection yoke is replaced or if someone has disturbed the setting. The complete procedure consists of:

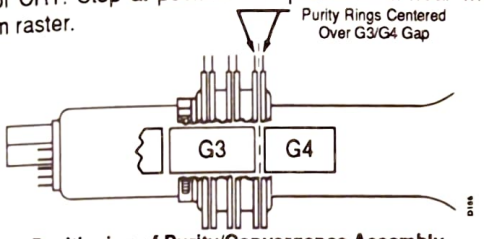
1. Initial static convergence
2. Setting purity
3. Final static convergence

When CRT or Yoke is Replaced

Place the yoke on the CRT neck (do not tighten clamp).

Position purity/convergence assembly as shown and tighten clamp snugly. Cut wax seal on assembly and place like tabs of purity device together at 12 o'clock to reduce its magnetic field effect. Manually degauss CRT.

Turn Receiver ON and slide deflection yoke back and forth on neck of CRT. Stop at position that produces a near white, uniform raster.



Positioning of Purity/Convergence Assembly

Initial Center Static Convergence

Connect dot/crosshatch generator to Receiver and tune in signal. Observe misconvergence at center of screen only.

Adjust 4 pole magnet (center rings): separate tabs and rotate device to converge blue with red.

Adjust 6 pole magnet (rear rings): separate tabs and rotate device to converge blue and red (magenta) with green. NOTE: Precise convergence at this point is not important.

Purity Adjustment

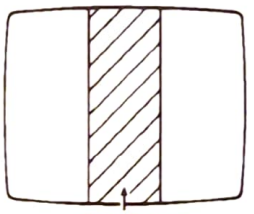
Operate the Receiver for 60 minutes with BRIGHT control at maximum to stabilize the CRT.

Degauss the Receiver fully by using an external degaussing coil.

Short TP14 to ground for blank raster. Set VIDEO MENU BRIGHT to mid position.

Turn red and blue LOW LIGHT controls fully counterclockwise to obtain a green field. Adjust DRIVE controls if green field is not obtained. Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

Adjust the purity magnet to set the vertical green raster precisely at the center of the screen. (Shown below.)



Green Raster

Slowly move the deflection yoke forward and adjust for the best overall green screen.

Tighten the deflection yoke clamp screw.

Produce a blue and then red raster by LOW LIGHT controls and observe that good purity is obtained on each respective field.

Observe that uniform white raster is obtained by adjusting LOW LIGHT controls. If screen is not uniformly white, repeat above procedure.

Final Convergence Procedure

NOTE: Before attempting convergence adjustment, vertical size and focus adjustments must be completed. Connect a dot pattern generator to the set. The brightness level should be no higher than necessary to obtain a clear pattern.

Converge the red and blue dots at the center of the screen by rotating the 4 pole (R with B) Static Convergence Magnets.

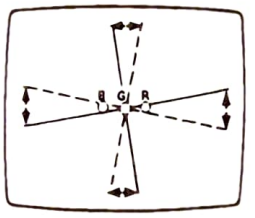
Align the converged red/blue dots with the green dots at the center of the screen by rotating the 6 pole (R/B with G) Static Convergence Magnets. Melt wax with soldering pencil to reseal magnets.

Slightly tilt (do not rotate) the deflection yoke vertically and horizontally to obtain good overall convergence.

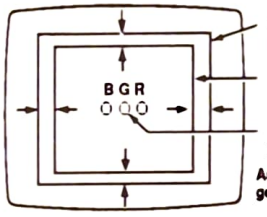
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.

Secure deflection yoke by inserting side two wedges at 3 and 7 o'clock positions.

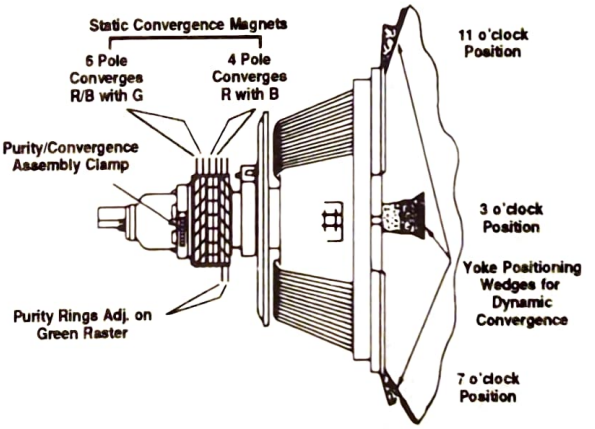
Apply adhesive between tab (thin portion) of wedge and CRT and place tape over tab to secure CRT.



As the yoke is moved vertically, the rasters produced by the outside guns rotate in opposite directions.


B G R
Raster produced from one of the outside electron beams
Raster from the other outside electron beam
Static convergence magnets are set for center convergence

As the yoke is moved horizontally, one raster gets larger while the other gets smaller


Static Convergence Magnets
6 Pole Converges R/B with G
4 Pole Converges R with B
Purity/Convergence Assembly Clamp
Purity Rings Adj. on Green Raster
11 o'clock Position
3 o'clock Position
Yoke Positioning Wedges for Dynamic Convergence
7 o'clock Position

Permalloy Convergence Corrector Strip (Part No. OFMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.

First converge the set without the strip and observe the corners.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.

New Circuits

Horizontal Disable Circuit (X–Ray Protection)

This circuit protects against both excessive high voltage and CRT beam current. If for any reason high voltage and/or beam current exceeds a predetermined level, the circuit operates to shift horizontal frequency and limit high voltage.

Horizontal pulses from pin 6 of flyback transformer T551 are rectified by diode D531. The resultant positive DC voltage at the cathode of D531 is directly proportional to high voltage variations. This voltage is filtered and applied to the base of transistor Q531 via R532/R533 precision resistive divider.

The emitter voltage of Q531 is clamped by zener diode D533 to establish Q531's operating level. Under normal operation conditions, Q531 is cutoff, thus its collector is at the +12 volts (source), which also keeps transistors Q532 and Q533 non–conductive.

If high voltage should increase, the horizontal pulse amplitude at pin 6 of flyback T551 increases, so the positive voltage at the cathode of D531 also increases. At a specified high voltage level, Q531 conducts, and the voltage at its collector and at the base of PNP transistor Q532 decreases.

Transistor Q532 conducts and the voltage drop across its collector resistor causes transistor Q533 to conduct. Q533 acts as a resistance in parallel with the Horizontal AFC Filter circuit R502/C506/C507. As it conducts, its resistance lowers and thus dampens the Horizontal AFC Filter circuit. This produces an increase in the horizontal oscillator frequency and lowers the high voltage.

Increased CRT beam current produces more ABL negative voltage at pin 3 of T551, which is coupled to the emitter of Q531 via R534. This increased negative voltage opposes Q531's positive emitter voltage,which brings the transistor closer to conduction. Thus, excessive levels of high voltage and CRT beam current causes conduction of all three transistors to assure operation within safe limits.

As an added precaution against X–radiation, when Q532 conducts and its emitter voltage lowers, Q454 conducts to blank the CRT. The negative going voltage from the emitter of Q532 is coupled to the base of Q454 via R540. This causes Q454 to conduct, and the voltage drop across its collector resistor causes diode D454 to conduct and apply roughly +12 volts to the Y–Output (video line). The +12 volts drives the video information into the black area and causes the picture screen to go black.

Servicing Procedure

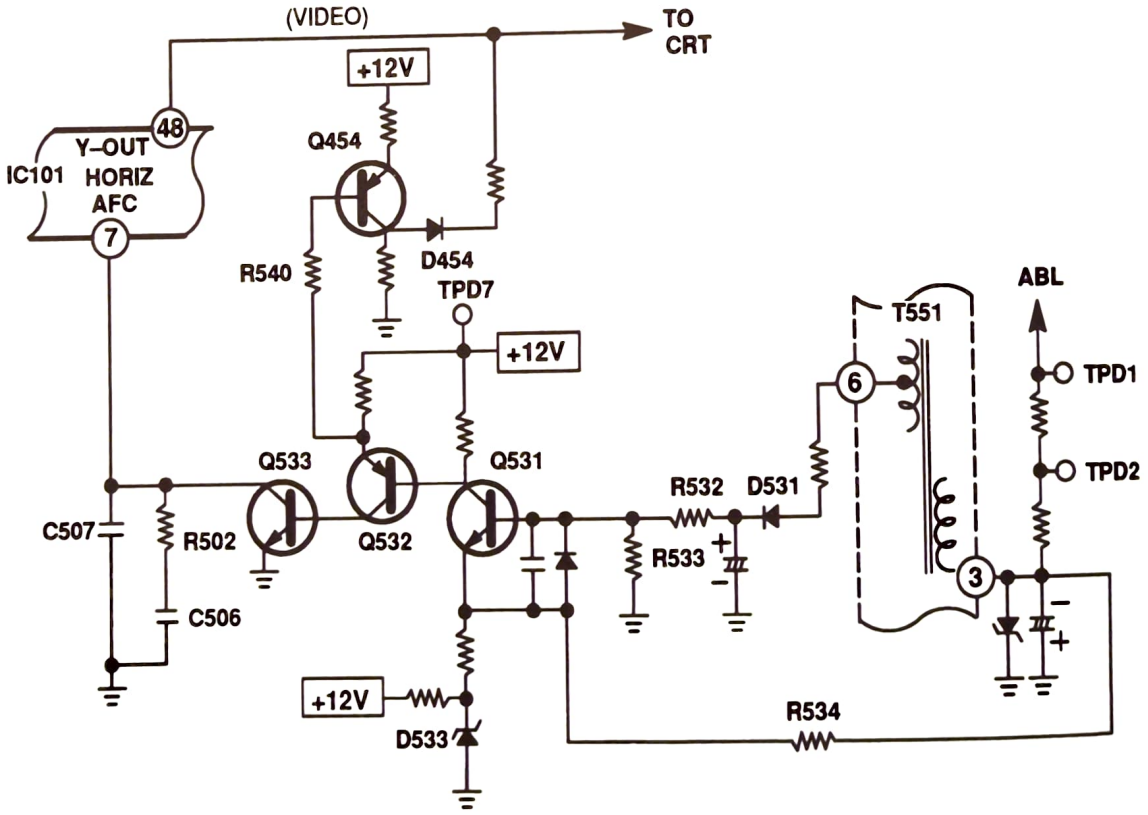
If the horizontal is off frequency, the cause must be determined to be either the disable circuit or horizontal circuit. Also, if the disable circuit does not operate during the "Horizontal Disable Test" specified in this manual, the fault must be corrected in order to insure that high voltage and CRT beam current do not exceed safe operation parameters.

SYMPTOM – No Change In Frequency When "Horizontal Disable Test" Is Performed.

NOTE: B+ (TP91) should increase between 153 – 162 volts when disable test is performed.

1. Turn ON Transistors Q533/Q532/Q531.
   Connect a 33k resistor jumper as follows:
   - Q533 – base to TPD7 (+12V)
   - Q532 – base to TPS9 (ground)
   - Q531 – base to TPD7(+12V)

   Horizontal frequency should increase as each transistor is activated. Check out the stage where this does not occur.
2. If all transistors turn ON, check voltage at base of Q531. If low or zero, check R532, C531, D531, R531 and the amplitude of waveform at Pin 6 of flyback transformer T551.



New Circuits

CRT Protection Circuit

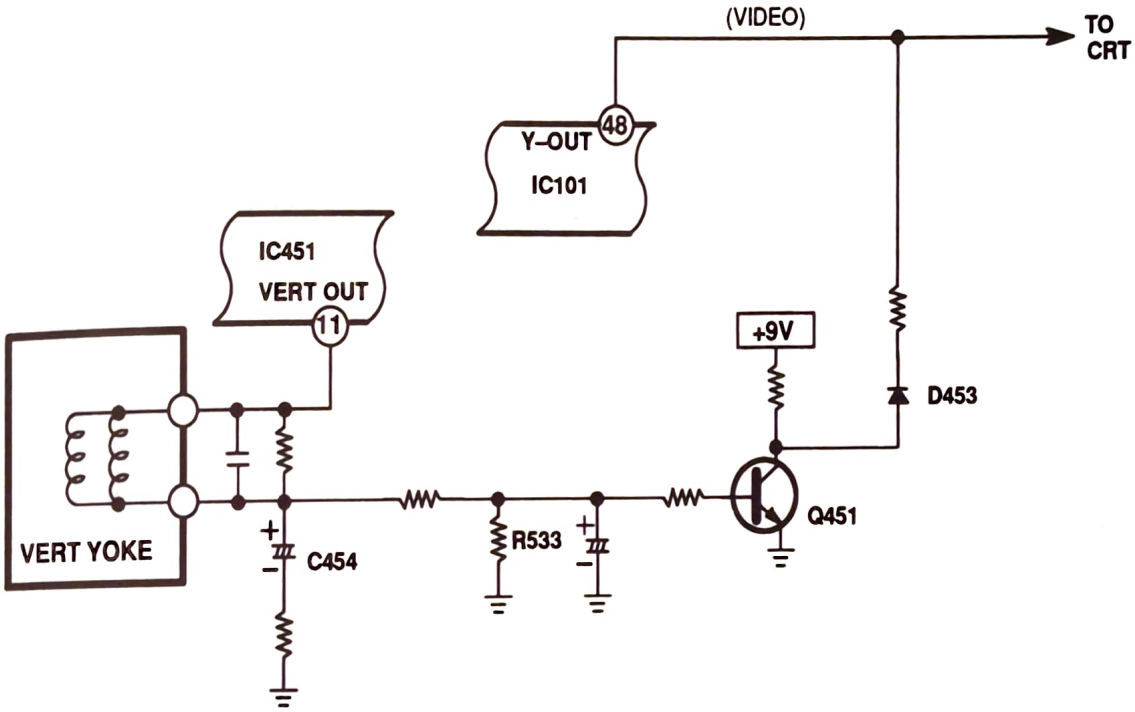
This circuit blanks the CRT in the event of vertical sweep loss and also functions as a CRT spot killer when the Receiver is turned OFF.

During normal operation the vertical sweep waveform from vertical output (IC451) supplies a positive voltage to the base of Q451. Its conduction grounds the anode of D453 and the diode does not conduct, to allow normal video.

Any failure mode causing loss of the vertical sweep waveform will allow the charge on C454 to discharge and results in the voltage at the base of Q451 to decrease and stop its conduction. This allows D453 to conduct and supply roughly +9 volts to the video path going to the CRT. The increased DC voltage drives the video information into the black area and blanks the CRT.

When the Receiver is turned OFF, the vertical sweep waveform disappears but the +9 volts decays slowly. Thus the circuit operates to blank the CRT to provide spot burn protection.

Note that any failure mode causing transistor Q451 to be non–conductive will result in the CRT to blank. The easiest way to confirm that the blanking circuit is active, causing a no raster symptom, is to measure the collector voltage of Q451. If it is approximately +9 volts, then D453 is conducting to cause CRT blanking.



REPLACEMENT PARTS LIST

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

Ref. No.	Part No.	Description
CAPRISTORS		
CRA801	**EXNG131P155**	**RES–CAP 130PF/1.5MEG**
CAPACITORS		
C001	ECKF1H103ZF	CAP,C .01UF–Z–50V
C002	ECEA1EU4R7	CAP,E 4.7UF/25V
C004	ECKF1H101KB	CAP,C 100PF–K–50V
C009	ECEA1HU010	CAP,E 1UF/50V
C013	ECKF1H103ZF	CAP,C .01UF–Z–50V
C014	ECEA0JU222	CAP,E 2200UF/6.3V
C017	ECEA0JU101	CAP,E 100UF/6.3V
C018	ECEA1CU100	CAP,E 10UF/16V
C019	ECKF1H103ZF	CAP,C .01UF–Z–50V
C021	ECKF1H821KB	CAP,C 820PF–K–50V
C022	ECCF1H330JP	CAP,C 33PF–J–50V
C023	ECCF1H150JP	CAP,C 15PF–J–50V
C024	ECEA0JU101	CAP,E 100UF/6.3V
C025	ECKF1H561KB	CAP,C 560PF–K–50V
C026	ECEA1CU102	CAP,E 1000UF/16V
C027	ECEA1CU100	CAP,E 10UF/16V
C028	ECEA1CU100	CAP,E 10UF/16V
C029	ECKF1H103ZF	CAP,C .01UF–Z–50V
C030	ECEA1CU100	CAP,E 10UF/16V
C031	ECRHA030E41	TRIMMER: 30PF
C033	ECEA0JU101	CAP,E 100UF/6.3V QC–20F21R TP1921FE
C034	ECKF1H103ZF	CAP,C .01UF–Z–50V
C035	ECKF1H103ZF	CAP,C .01UF–Z–50V
C036	ECEA0JU101	CAP,E 100UF/6.3V
C037	ECEA0JU101	CAP,E 100UF/6.3V
C044	ECKF1H103ZF	CAP,C .01UF–Z–50V
C045	ECEA1CU102	CAP,E 1000UF/16V
C057	ECEA1CU100	CAP,E 10UF/16V
C071	ECKF1H103ZF	CAP,C .01UF–Z–50V
C103	ECCF1H020CC	CAP,C 2PF–C–50V
C104	ECCF1H020CC	CAP,C 2PF–C–50V
C105	ECKF1H103ZF	CAP,C .01UF–Z–50V
C106	ECKF1H103ZF	CAP,C .01UF–Z–50V
C109	ECEA50ZR22	CAP,E .22UF/50V
C110	ECEA50ZR47	CAP,E .47UF/50V
C112	ECCF1H180JC	CAP,C 18PF–J–50V
C115	ECEA1AU101	CAP,E 100UF/10V
C119	ECKF1H561KB	CAP,C 560PF–K–50V
C120	ECEA0JU101	CAP,E 100UF/6.3V
C121	ECKF1H103ZF	CAP,C .01UF–Z–50V
C122	ECKF1H103ZF	CAP,C .01UF–Z–50V
C124	ECCF1H101KB	CAP,C 100PF–K–50V
C126	ECKF1H561KB	CAP,C 560PF–K–50V
C151	ECCF1H680JC	CAP,C 68PF–J–50V
C152	ECCF1H150JC	CAP,C 15PF–J–50V
C153	ECKF1H103ZF	CAP,C .01UF–Z–50V
C154	ECEA1HUR22	CAP,E .22UF/50V
C155	ECCF1H020CC	CAP,C 2PF–C–50V
C201	ECQM1H682KV	CAP,P .0068UF–K–50V
C202	ECEA1HU010	CAP,E 1UF/50V
C203	ECKF1H103ZF	CAP,C .01UF–Z–50V
C204	ECEA1HU010	CAP,E 1UF/50V
C205	ECEA1HU010	CAP,E 1UF/50V
C206	ECKF1H102KB	CAP,C .001UF–K–50V
C207	ECCF1H680KP	CAP,C 68PF–K–50V
C208	ECEA1CU220	CAP,E 22UF/16V
C209	ECKF1H332KB	CAP,C .0033UF–K–50V
C210	ECEA1CU100	CAP,E 10UF/16V
C211	ECEA1EU331	CAP,E 330UF/25V
C212	ECKF1H103ZF	CAP,C .01UF–Z–50V
C213	ECEA1EU221	CAP,E 220UF/25V
C214	ECEA1CU100	CAP,E 10UF/16V
C215	ECQM1H683KV	CAP,P .068UF–K–50V
C301	ECEA1CN100S	CAP,E 10UF/16V
C302	ECEA1CU220	CAP,E 22UF/16V
C303	ECEA1HU3R3	CAP,E 3.3UF/50V
C305	ECEA1CU100	CAP,E 10UF/16V
C306	ECEA1HU2R2	CAP,E 2.2UF/50V
C307	ECEA1HU0R1	CAP,E .1UF/50V
C309	ECEA1HU010	CAP,E 1UF/50V
C310	ECEA1HU010	CAP,E 1UF/50V
C312	ECEA1CU220	CAP,E 22UF/16V
C314	ECCF1H180JC	CAP,C 18PF–J–50V CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
——	ECCF1H330JC	CAP,C 33PF–J–50V CTN–1942R TP1911FW
C350	ECKD3D102KB	CAP,C .001UF–K–2KV
C351	ECKF1H561KB	CAP,C 560PF–K–50V
C352	ECKF1H391KB	CAP,C 390PF–K–50V
C353	ECKF1H681KB	CAP,C 680PF–K–50V
C355	ECKD2H102KB	CAP,C .001UF–K–500V
C360	ECKF1H331KB	CAP,C 330PF–K–50V
C401	ECEA1HU010	CAP,E 1UF/50V
C402	ECQM1H223KV	CAP,P .022UF–K–50V
C403	ECEA1HU2R2	CAP,E 2.2UF/50V
C405	ECKF1H122KB	CAP,C .0012UF–K–50V
C451	ECEA1CU221	CAP,E 220UF/16V
C452	ECSF25E1VB	CAP,T 1.0UF/25V CTN–1955R CTN–1956R PC–20X56R
C452	ECSZ25EF1V	CAP,T 1UF/25V CTN–1942R QC–20F21R TP1911FW TP1921FE
C453	ECEA50Z1R5	CAP,E 1.5UF/50V
C454	ECEA1EU102	CAP,E 1000UF/25V
C455	ECEA1VU101	CAP,E 100UF/35V
C457	ECEA1HU0R1	CAP,E .1UF/50V
C458	ECEA1CU100	CAP,E 10UF/16V
C459	ECQM1103KZ	CAP,P .01UF–K–100V
C501	ECQM1H822KV	CAP,P .0082UF–K–50V
C502	ECQM1H223KV	CAP,P .022UF–K–50V
C503	ECCF1H221JU	CAP,C 220PF–J–50V
C504	ECEA1AU331	CAP,E 330UF/10V
C505	ECKF1H221KB	CAP,C 220PF–K–50V
C506	ECEA1HU010	CAP,E 1UF/50V
C507	ECQM1H333KV	CAP,P .033UF–K–50V
C510	ECQM1H473KV	CAP,P .047UF–K–50V
C512	ECKF1H331KB	CAP,C 330PF–K–50V
C513	ECCD2H100F	CAP,C 10PF–F–500V
C514	ECKD2H821KB	CAP,C 820PF–K–500V
C515	ECKD2H821KB	CAP,C 820PF–K–500V
C518	ECQM1H223KV	CAP,P .022UF–K–50V
C531	**ECEA1EU330**	**CAP,E 33UF/25V**
C533	**ECKF1H103ZF**	**CAP,C .01UF–Z–50V**
C541	ECKF1H221KB	CAP,C 220PF–K–50V
C542	ECKF1H101KB	CAP,C 100PF–K–50V
C551	**ECQF2H394JS**	**CAP,P .39UF–J–200V CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE**
——	**ECQF2H474JS**	**CAP,P .47UF–J–200V PC–20X56R QC–20F21R**
C552	**ECEA1EU221**	**CAP,E 220UF/25V**
C553	**ECEA2EU100W**	**CAP,E 10UF/250V**
C554	ECKD2H561KB	CAP,C 560PF–K–500V
C555	ECKD2H561KB	CAP,C 560PF–K–500V
C557	ECEA1HU2R2	CAP,E 2.2UF/50V
C558	ECEA1AU331	CAP,E 330UF/10V
C559	**ECEA1EU221**	**CAP,E 220UF/25V**

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
NOTE:	REPLACE C561	**WITH ORIGINAL VALUE ONLY**
C561	**ECKD3D102JB**	**CAP,C .001UF–J–2KV**
——	**ECKD3D122JB**	**CAP,C .0012UF–J–2KV**
——	**ECKD3D152JB**	**CAP,C .0015UF–J–2KV**
——	**ECKD3D331JB**	**CAP,C 330PF–J–2KV**
——	**ECKD3D391JB**	**CAP,C 390PF–J–2KV**
——	**ECKD3D471JB**	**CAP,C 470PF–J–2KV**
——	**ECKD3D561JB**	**CAP,C 560PF–J–2KV**
——	**ECKD3D681JB**	**CAP,C 680PF–J–2KV**
——	**ECKD3D821JB**	**CAP,C 820PF–J–2KV**
——	**ECWH12H822JS**	**CAP,P .0082UF–J–1.2KV**
C563	**ECEA1VU221**	**CAP,E 220UF/35V**
C566	ECKF1H103ZF	CAP,C .01UF–Z–50V
C567	**ECKD2H561KB**	**CAP,C 560PF–K–500V**
C568	ECEA1CU221	CAP,E 220UF/16V
C570	ECKF1H103ZF	CAP,C .01UF–Z–50V
C571	**ECKD3D102JB**	**CAP,C .001UF–J–2KV**
C572		**CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE**
C575	**ECKD3D561JB**	**CAP,C 560PF–J–2KV**
C576	ECEA1EU220	CAP,E 22UF/25V
C601	ECKF1H103ZF	CAP,C .01UF–Z–50V
C605	ECCF1H080DU	CAP,C 8PF–D–50V
C606	ECEA50ZR47	CAP,E .47UF/50V
C607	ECKF1H101KB	CAP,C 100PF–K–50V
C608	ECKF1H101KB	CAP,C 100PF–K–50V
C609	ECKF1H101KB	CAP,C 100PF–K–50V
C625	ECEA1CU100	CAP,E 10UF/16V
C626	ECKF1H271KB	CAP,C 270PF–K–50V
C802	**ECKD2H103PU**	**CAP,C .01UF–P–500V**
C803	**ECKD2H103PU**	**CAP,C .01UF–P–500V**
C804	**ECKD2H103PU**	**CAP,C .01UF–P–500V**
C805	**ECES2DU221E4**	**CAP,E 220UF/200V**
C806	**ECEA2CU220W**	**CAP,E 22UF/160V**
C812	**ECEA160V33Z**	**CAP,E 33UF/160V**
C817	**ECQU1A153KH**	**CAP,P .015UF–K–125VAC**
C818	**ECQU1A153KH**	**CAP,P .015UF–K–125VAC**
C819	**ECKCFL222ZE**	**CAP,C .0022UF–Z–125VAC**
C3101	ECEA1HU010	CAP,E 1UF/50V CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
C3105	ECEA1AU101	CAP,E 100UF/10V CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
C3106	ECEA1HN010S	CAP,E 1UF/50V CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
DIODES		
D004	MA165	DIODE
D005	TVSQA205D	DIODE
D020	MA165	DIODE
D021	MA27TA	DIODE
D022	1N4532	DIODE
D025	MA165	DIODE
D026	MA165	DIODE
D031	ERA15–01	DIODE
D032	1N4532	DIODE
D034	LN320GP–LS	DIODE, LED TP1911FW
——	SEL1320G	DIODE, LED CTN–1955R CTN–1956R PC–20X56R
——	SEL1410G	DIODE, LED QC–20F21R TP1921FE
D036	MA150	DIODE QC–20F21R TP1921FE

Ref. No.	Part No.	Description
D101	MA165	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
D302	1N4532	DIODE
D304	MA856TV	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
D352	MA165	DIODE
D353	MA4047L	DIODE, ZENER
D383	MA27WA	DIODE
D451	ERA15–01	DIODE
D452	MA165	DIODE
D453	MA165	DIODE
D454	1N4532	DIODE
D470	MA4051H	DIODE, ZENER
D502	TVSQA208C	DIODE, ZENER
D503	MA165	DIODE
D506	TVSQA206B	DIODE, ZENER
D531	**AS01**	**DIODE**
D532	**MA165**	**DIODE**
D533	**TVSQA208G**	**DIODE, ZENER**
D542	MA165	DIODE
D551	**RU2N**	**DIODE**
D552	**AS01**	**DIODE**
D553	**AS01**	**DIODE**
D554	**AS01**	**DIODE**
D555	MA165	DIODE
D556	MA1360H	DIODE, ZENER
D557	TVSQB105N	DIODE, ZENER CTN–1942R CTN–1955R CTN–1956R PC–20X56R TP1911FW
D560	TVSQB109SA	DIODE, ZENER
D603	1N4532	DIODE
D801	**EM02BM**	**DIODE**
D802	**EM02BM**	**DIODE**
D803	**EM02BM**	**DIODE**
D804	**EM02BM**	**DIODE**
D806	**ERPF5B0M050K**	**THERMISTOR**
D3101	MA165	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
D3102	MA165	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
D3103	MA165	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
D3104	MA165	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
D3105	MA165	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
D3106	MA165	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
D3107	MA165	DIODE CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
FUSES		
F001	**XBA1F40NU100**	**FUSE 4.0A/125V**

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
INTEGRATED CIRCUITS		
IC001	MN15151Q14R	INT CKT
IC101	**AN5160NK-N**	**INT CKT**
IC201	AN5265	INT CKT
IC451	LA7835-TV	INT CKT
IC551	**AN78M12**	**PLUS 12V AVR**
IC801	**TVSSTR30130**	**INT CKT**
COILS		
L006	TLUABTA5R6K	COIL, PEAKING 5.6UH
L007	TLUABTA5R6K	COIL, PEAKING 5.6UH
L008	TLUABTA5R6K	COIL, PEAKING 5.6UH
L010	EXCELSA24	FERRITE BEAD
L011	TLUABTA1R0K	COIL, PEAKING 1.0UH
L103	TLI67394-1	COIL, AFT
L104	TLQ012K205C	COIL, PEAKING 1.2UH
L105	TLI158755	COIL, VCO
L106	TLUABTA150K	COIL, PEAKING 15UH
L108	TLQ012K205C	COIL, PEAKING 1.2UH
L109	EXCELSA35	FERRITE BEAD
L201	TLS63318-2	COIL, QUADRATURE
L202	TLUABTA4R7K	COIL, PEAKING 4.7UH
L301	ELB5A082	3.58MHZ TRAP
L354	TLUABTA151K	COIL, PEAKING 150UH
L551	**TLH15654P**	**COIL, LINEARITY PC-20X56R QC-20F21R**
——	**TLH15661P**	**COIL, LINEARITY CTN-1942R CTN-1955R CTN-1956R TP1911FW TP1921FE**
L555	**EXCELSA24**	**FERRITE BEAD**
L556	**TSC925-4**	**FERRITE BEAD**
L570	**TLY26330FA**	**YOKE, DEFLECTION CTN-1942R CTN-1955R CTN-1956R TP1911FW TP1921FE**
——	**0LY15303F**	**YOKE, DEFLECTION PC-20X56R QC-20F21R**
L580	EXCELSA39	FERRITE BEAD CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
L801	**ELF18D650A**	**CHOKE, AC LINE**
L804	**0LK19016C**	**COIL, DEGAUSSING PC-20X56R QC-20F21R**
——	**0LK19016M**	**COIL, DEGAUSSING CTN-1942R CTN-1955R CTN-1956R TP1911FW TP1921FE**
TRANSISTORS		
Q001	2SC1685QR	TRANSISTOR
Q002	2SA564AQR	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
Q004	2SC1685QR	TRANSISTOR
Q005	2SA564AQR	TRANSISTOR
Q006	2SC1685QR	TRANSISTOR
Q007	2SC1685QR	TRANSISTOR
Q015	2SA564AQR	TRANSISTOR
Q019	2SC1685QR	TRANSISTOR
Q102	2SA564AQR	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
——	2SC1685QR	TRANSISTOR CTN-1942R TP1911FW
Q301	2SC1685QR	TRANSISTOR
Q303	2SA719QR	TRANSISTOR
Q304	2SC1685QR	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
Q316	2SC1685QR	TRANSISTOR
Q351	2SC1573NC	TRANSISTOR
Q352	2SC1573NC	TRANSISTOR
Q353	2SC1573NC	TRANSISTOR
Q451	2SC1685QR	TRANSISTOR
Q454	2SA564AQR	TRANSISTOR
Q501	2SC1573AH	TRANSISTOR
Q531	**2SC1685QR**	**TRANSISTOR**
Q532	**2SA564AQR**	**TRANSISTOR**
Q533	**2SC1685QR**	**TRANSISTOR**
Q541	2SC1685QR	TRANSISTOR
Q551	**2SD1439P**	**TRANSISTOR**
Q601	2SC1685QR	TRANSISTOR
Q602	2SC1685QR	TRANSISTOR
Q603	2SC1685QR	TRANSISTOR
Q604	2SC1685QR	TRANSISTOR
Q3101	2SC1685QRS	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
Q3102	2SC1685QRS	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
Q3103	2SC1685QRS	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
Q3104	2SA564AQRS	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
Q3105	2SC1685QRS	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
Q3106	2SC1685QRS	TRANSISTOR CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
RELAYS		
RL001	**TSE1864**	**RELAY**
RESISTORS		
R001	ERD25TJ102	RES,C 1K-J-1/4 CTN-1942R TP1911FW
——	ERD25TJ122	RES,C 1.2K-J-1/4 CTN-1955R CTN-1956R PC-20X56R QC-20F21R TP1921FE
R008	ERD25TJ182	RES,C 1.8K-J-1/4
R009	ERD25TJ182	RES,C 1.8K-J-1/4
R012	ERDS2TJ103	RES,C 10K-J-1/4
R013	ERDS2TJ473	RES,C 47K-J-1/4
R015	ERDS2TJ103	RES,C 10K-J-1/4
R016	ERDS2TJ222	RES,C 2.2K-J-1/4
R020	ERDS2TJ392	RES,C 3.9K-J-1/4
R021	ERDS2TJ682	RES,C 6.8K-J-1/4
R022	ERDS2TJ273	RES,C 27K-J-1/4
R023	ERDS2TJ392	RES,C 3.9K-J-1/4
R024	ERDS2TJ683	RES,C 68K-J-1/4
R025	ERDS2TJ331	RES,C 330-J-1/4
R026	ERDS2TJ393	RES,C 39K-J-1/4
R028	ERDS2TJ331	RES,C 330-J-1/4
R030	ERD25TJ823	RES,C 82K-J-1/4
R031	ERDS2TJ823	RES,C 82K-J-1/4

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R032	ERD25TJ562	RES,C 5.6K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R035	ERD25TJ331	RES,C 330–J–1/4
R037	ERDS2TJ562	RES,C 5.6K–J–1/4
R045	ERDS2TJ822	RES,C 8.2K–J–1/4
R049	ERDS2TJ223	RES,C 22K–J–1/4
R050	ER0S2CKF1002	RES,M 10K–F–1/4
R051	ER0S2CKF1002	RES,M 10K–F–1/4
R052	ERD25TJ333	RES,C 33K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R053	ERD25TJ224	RES,C 220K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R055	ERDS1FJ330	RES,C 33–J–1/2
R056	ERD25TJ562	RES,C 5.6K–J–1/4
R058	ERDS2TJ222	RES,C 2.2K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R059	ERDS2TJ222	RES,C 2.2K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R060	ERDS2TJ332	RES,C 3.3K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R061	ERDS2TJ512	RES,C 5.1K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R064	ERDS2TJ432	RES,C 4.3K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R065	ERDS2TJ332	RES,C 3.3K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R071	ERD25TJ392	RES,C 3.9K–J–1/4
R072	ERDS2TJ473	RES,C 47K–J–1/4
R074	ERG1SJ683	RES,M 68K–J–1W
R075	ERDS2TJ103	RES,C 10K–J–1/4
R076	ERDS2TJ682	RES,C 6.8K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R078	ERDS2TJ101	RES,C 100–J–1/4
R079	ERDS2TJ561	RES,C 560–J–1/4
R080	ERDS2TJ391	RES,C 390–J–1/4
R081	ERDS2TJ122	RES,C 1.2K–J–1/4
R083	ERDS2TJ103	RES,C 10K–J–1/4
R085	ERDS2TJ393	RES,C 39K–J–1/4
R086	ERDS2TJ473	RES,C 47K–J–1/4
R087	ERDS2TJ472	RES,C 4.7K–J–1/4
R088	ERDS2TJ183	RES,C 18K–J–1/4
R090	ERDS2TJ622	RES,C 6.2K–J–1/4
R092	ERD25TJ272	RES,C 2.7K–J–1/4
R093	ERDS2TJ562	RES,C 5.6K–J–1/4
R094	ERD25TJ562	RES,C 5.6K–J–1/4
R095	ERD25TJ101	RES,C 100–J–1/4
R096	ERD25TJ101	RES,C 100–J–1/4
R097	ERD25TJ101	RES,C 100–J–1/4
R106	EVN60AA00B53	CONTROL 5K
R107	ERDS2TJ561	RES,C 560–J–1/4
R108	ERDS2TJ222	RES,C 2.2K–J–1/4
R109	ERDS2TJ221	RES,C 220–J–1/4
R110	ERDS2TJ822	RES,C 8.2K–J–1/4
R111	ERDS2TJ223	RES,C 22K–J–1/4
R112	ERDS2TJ121	RES,C 120–J–1/4
R114	EVND4AA00B23	CONTROL 2K CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R118	ERDS2TJ122	RES,C 1.2K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R151	ERDS2TJ274	RES,C 270K–J–1/4
R152	ERD25TJ104	RES,C 100K–J–1/4
R153	ERDS2TJ472	RES,C 4.7K–J–1/4
R201	ERDS2TJ102	RES,C 1K–J–1/4
R202	ERDS2TJ823	RES,C 82K–J–1/4
R203	ERDS2TJ471	RES,C 470–J–1/4
R204	ERDS2TJ122	RES,C 1.2K–J–1/4
R205	ERDS2TJ681	RES,C 680–J–1/4
R206	ERQ1CJP220	RES,F 22–J–1W
R207	ERD25FJ4R7	RES,C 4.7–J–1/4
R209	ERDS2TJ821	RES,C 820–J–1/4
R210	ERDS2TJ153	RES,C 15K–J–1/4
R211	ERDS2TJ222	RES,C 2.2K–J–1/4
R212	ERDS2TJ332	RES,C 3.3K–J–1/4
R213	ERDS2TJ102	RES,C 1K–J–1/4
R214	ERDS2TJ103	RES,C 10K–J–1/4
R301	ERDS2TJ471	RES,C 470–J–1/4
R303	ERDS2TJ182	RES,C 1.8K–J–1/4
R304	EVND4AA00B23	CONTROL 2K
R305	ERDS2TJ153	RES,C 15K–J–1/4
R306	ERDS2TJ561	RES,C 560–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R307	ERDS2TJ470	RES,C 47–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R308	ERDS2TJ683	RES,C 68K–J–1/4
R309	ERDS2TJ333	RES,C 33K–J–1/4
R310	ERDS2TJ472	RES,C 4.7K–J–1/4
R311	ERD25TJ151	RES,C 150–J–1/4
R314	ERDS2TJ561	RES,C 560–J–1/4
R316	ERDS2TJ272	RES,C 2.7K–J–1/4
R317	ERD25TJ203	RES,C 20K–J–1/4
R318	EVN60AA00B14	CONTROL 10K
R320	ERDS2TJ103	RES,C 10K–J–1/4
R323	ERD25TJ393	RES,C 39K–J–1/4
R324	ERDS2TJ185	RES,C 1.8MEG–J–1/4
R326	ERDS2TJ562	RES,C 5.6K–J–1/4
R327	ERD25TJ102	RES,C 1K–J–1/4
R334	ERD25TJ102	RES,C 1K–J–1/4
R336	ERD25TJ222	RES,C 2.2K–J–1/4
R337	ERDS2TJ224	RES,C 220K–J–1/4
R339	ERDS2TJ393	RES,C 39K–J–1/4
R351	ERG2ANJ123	RES,M 12K–J–2W
R352	ERG2ANJ123	RES,M 12K–J–2W
R353	ERG2ANJ123	RES,M 12K–J–2W
R354	EVN49AA00B23	CONTROL 2K
R355	EVN49AA00B23	CONTROL 2K
R356	EVN49AA00B23	CONTROL 2K
R357	EVN49AA00B32	CONTROL 300 OHM
R358	EVN49AA00B32	CONTROL 300 OHM
R360	ERDS2TJ151	RES,C 150–J–1/4 CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
——	ERDS2TJ181	RES,C 180–J–1/4 PC–20X56R QC–20F21R
R361	ERDS2TJ681	RES,C 680–J–1/4
R363	ERDS2TJ271	RES,C 270–J–1/4
R364	ERDS1TJ272	RES,C 2.7K–J–1/2
R365	ERDS1TJ272	RES,C 2.7K–J–1/2

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R367	ERDS2TJ181	RES,C 180–J–1/4 CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
——	ERDS2TJ221	RES,C 220–J–1/4 PC–20X56R QC–20F21R
R368	ERDS2TJ681	RES,C 680–J–1/4
R369	ERDS1TJ272	RES,C 2.7K–J–1/2
R380	ERDS2TJ681	RES,C 680–J–1/4
R382	ERDS2TJ821	RES,C 820–J–1/4
R383	ERDS2TJ681	RES,C 680–J–1/4
R384	ERDS2TJ471	RES,C 470–J–1/4
R401	ERDS2TJ684	RES,C 680K–J–1/4
R402	ERDS2TJ681	RES,C 680–J–1/4
R403	ERDS2TJ271	RES,C 270–J–1/4
R451	ERD25TJ122	RES,C 1.2K–J–1/4
R452	ERD25TJ273	RES,C 27K–J–1/4
R453	EVN60AA00B54	CONTROL 50K
R454	ERDS1FJ2R2	RES,C 2.2–J–1/2
R455	ERDS2TJ183	RES,C 18K–J–1/4 CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
——	ERDS2TJ223	RES,C 22K–J–1/4 PC–20X56R QC–20F21R
R456	ERDS2TJ562	RES,C 5.6K–J–1/4 CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
——	ERDS2TJ682	RES,C 6.8K–J–1/4 PC–20X56R QC–20F21R
R457	ERDS2TJ122	RES,C 1.2K–J–1/4 CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
——	ERDS2TJ222	RES,C 2.2K–J–1/4 PC–20X56R QC–20F21R
R458	ERDS2TJ223	RES,C 22K–J–1/4 CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
——	ERDS2TJ273	RES,C 27K–J–1/4 PC–20X56R QC–20F21R
R460	ERDS2TJ102	RES,C 1K–J–1/4
R461	ERDS2TJ113	RES,C 11K–J–1/4
R462	ERD25TJ103	RES,C 10K–J–1/4
R463	ERDS2TJ104	RES,C 100K–J–1/4
R464	ERDS2TJ223	RES,C 22K–J–1/4
R465	ERD25TJ222	RES,C 2.2K–J–1/4
R466	ERDS2TJ153	RES,C 15K–J–1/4
R468	ERDS2TJ152	RES,C 1.5K–J–1/4 PC–20X56R QC–20F21R
R469	ERDS2TJ104	RES,C 100K–J–1/4
R471	ERDS2TJ163	RES,C 16K–J–1/4
R501	ERDS2TJ222	RES,C 2.2K–J–1/4
R502	ERDS2TJ222	RES,C 2.2K–J–1/4
R503	ERDS2TJ392	RES,C 3.9K–J–1/4
R505	ERDS2TJ821	RES,C 820–J–1/4
R506	ERDS2TJ472	RES,C 4.7K–J–1/4
R508	ERDS2TJ821	RES,C 820–J–1/4
R509	**ERG2ANJ562**	**RES,M 5.6K–J–2W**
R510	**ERG2ANJ272**	**RES,M 2.7K–J–2W**
R512	ERDS2TJ332	RES,C 3.3K–J–1/4
R513	ERDS2TJ105	RES,C 1MEG–J–1/4
R515	ERDS2TJ181	RES,C 180–J–1/4
R516	ERD25TJ391	RES,C 390–J–1/4
R524	EVND4AA00B22	CONTROL 200 OHM
R531	**ERD25FJ470**	**RES,C 47–J–1/4**
R532	**ER0S2CKF2432**	**RES,M 24.3K–F–1/4**
R533	**ER0S2CKF1622**	**RES,M 16.2K–F–1/4** **PC–20X56R QC–20F21R**
——	**ER0S2CKF1742**	**RES,M 17.4K–F–1/4** **CTN–1942R CTN–1955R** **CTN–1956R TP1911FW TP1921FE**

Ref. No.	Part No.	Description
R534	**ERDS2TJ154**	**RES,C 150K–J–1/4**
R535	**ERDS2TJ272**	**RES,C 2.7K–J–1/4**
R536	**ERDS2TJ821**	**RES,C 820–J–1/4**
R537	**ERDS2TJ183**	**RES,C 18K–J–1/4**
R538	**ERDS2TJ822**	**RES,C 8.2K–J–1/4**
R539	**ERDS2TJ153**	**RES,C 15K–J–1/4**
R540	ERDS2TJ152	RES,C 1.5K–J–1/4
R541	ERD25TJ101	RES,C 100–J–1/4
R542	ERDS2TJ103	RES,C 10K–J–1/4
R544	ERD25TJ223	RES,C 22K–J–1/4
R547	ERDS2TJ103	RES,C 10K–J–1/4
R551	**ERQ1CJP1R0**	**RES,F 1.0–J–1W**
R552	**ERDS1FJ1R0**	**RES,C 1.0–J–1/2**
R553	**ERDS1FJ1R0**	**RES,C 1.0–J–1/2**
R554	ERDS2TJ104	RES,C 100K–J–1/4
R555	ERDS2TJ104	RES,C 100K–J–1/4 PC–20X56R QC–20F21R
——	ERDS2TJ823	RES,C 82K–J–1/4 CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
R556	ERDS2TJ332	RES,C 3.3K–J–1/4
R557	ERDS2TJ103	RES,C 10K–J–1/4
R558	**ERQ12HKR22**	**RES,F .22–K–1/2** **CTN–1942R CTN–1955R** **CTN–1956R TP1911FW** **TP1921FE**
——	**ERQ12HKR33**	**RES,F .33–K–1/2** **PC–20X56R QC–20F21R**
R559	ERG3ANJ680	RES,M 68–J–3W
R560	ERG2SJS680	RES,M 68–J–2W
R562	**ERG1ANJ122**	**RES,M 1.2K–J–1W**
R569	**ERDS1FJ101**	**RES,C 100–J–1/2** **CTN–1955R CTN–1956R** **PC–20X56R QC–20F21R** **TP1921FE**
R570	ERDS2TJ222	RES,C 2.2K–J–1/4
R575	ERDS1TJ681	RES,C 680–J–1/2
R604	ERDS2TJ224	RES,C 220K–J–1/4
R609	ERDS2TJ271	RES,C 270–J–1/4
R610	ERDS2TJ271	RES,C 270–J–1/4
R611	ERDS2TJ271	RES,C 270–J–1/4
R615	ERD25TJ102	RES,C 1K–J–1/4
R616	ERD25TJ102	RES,C 1K–J–1/4
R617	ERDS2TJ153	RES,C 15K–J–1/4
R618	ERDS2TJ103	RES,C 10K–J–1/4
R619	EVND4AA00B53	CONTROL 5K
R620	ERDS2TJ561	RES,C 560–J–1/4
R621	ERDS2TJ273	RES,C 27K–J–1/4
R622	ERD25TJ822	RES,C 8.2K–J–1/4
R623	ERDS2TJ272	RES,C 2.7K–J–1/4
R624	ERDS2TJ272	RES,C 2.7K–J–1/4
R626	ERDS2TJ152	RES,C 1.5K–J–1/4
R628	ERDS2TJ272	RES,C 2.7K–J–1/4
R629	ERDS2TJ822	RES,C 8.2K–J–1/4
R630	ERDS2TJ272	RES,C 2.7K–J–1/4
R631	ERDS2TJ471	RES,C 470–J–1/4
R632	ERDS2TJ152	RES,C 1.5K–J–1/4
R801	**ERF5ZKR82**	**RES,W .82–K–5W**
R802	**ERF15ZJ181**	**RES,W 180–J–15W**
R804	**ERDS2TJ224**	**RES,C 220K–J–1/4**
R805	**ERDS1TJ103**	**RES,C 10K–J–1/2**
R807	**ERD25FJ470**	**RES,C 47–J–1/4**
R808	**ERD25FJ330**	**RES,C 33–J–1/4**
R810	**ERQ3CJ5R6**	**RES,F 5.6–J–3W**
R811	**ERX3ANJ4R7**	**RES,M 4.7–J–3W**
R815	**ERC12ZGK275**	**RES,S 2.7MEG–K–1/2**
R816	**ERW12PK1R0**	**RES,W 1.0–K–1/2**
R1101	ERD25TJ474	RES,C 470K–J–1/4
R1400	ERDS2TJ222	RES,C 2.2K–J–1/4 CTN–1942R TP1911FW
R1401	ERDS2TJ222	RES,C 2.2K–J–1/4 CTN–1942R TP1911FW

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R1402	ERDS2TJ332	RES,C 3.3K–J–1/4 CTN–1942R TP1911FW
R1403	ERDS2TJ512	RES,C 5.1K–J–1/4 CTN–1942R TP1911FW
R1406	ERDS2TJ432	RES,C 4.3K–J–1/4 CTN–1942R TP1911FW
R3102	ERDS2TJ224	RES,C 220K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3103	ERDS2TJ124	RES,C 120K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3116	ERD25TJ563	RES,C 56K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3117	ERDS2TJ682	RES,C 6.8K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3118	ERDS2TJ821	RES,C 820–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3119	ERDS2TJ332	RES,C 3.3K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3120	ERDS2TJ223	RES,C 22K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3121	ERDS2TJ821	RES,C 820–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3123	ERDS2TJ222	RES,C 2.2K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3124	ERDS2TJ222	RES,C 2.2K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3126	ERDS2TJ103	RES,C 10K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3127	ERD25TJ103	RES,C 10K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3129	ERDS2TJ750	RES,C 75–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3130	ERDS2TJ101	RES,C 100–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3131	ERDS2TJ222	RES,C 2.2K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3132	ERDS2TJ182	RES,C 1.8K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3133	ERDS2TJ273	RES,C 27K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3135	ERDS2TJ333	RES,C 33K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3136	ERDS2TJ104	RES,C 100K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
R3138	ERDS2TJ272	RES,C 2.7K–J–1/4 CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
SWITCHES		
S001	EVQQBH12T	SWITCH, PUSH CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
S002	EVQQBH12T	SWITCH, PUSH CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
S003	EVQQBH12T	SWITCH, PUSH CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
S004	EVQQBH12T	SWITCH, PUSH CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
S005	EVQQBH12T	SWITCH, PUSH CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
S009	EVQQBH12T	SWITCH, PUSH CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
S010	EVQQBH12T	SWITCH, PUSH CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
S050	EVQQS607T	SWITCH CTN–1942R TP1911FW
S051	EVQQS607T	SWITCH CTN–1942R TP1911FW
S052	EVQQS607T	SWITCH CTN–1942R TP1911FW
S053	EVQQS607T	SWITCH CTN–1942R TP1911FW
S054	EVQQS607T	SWITCH CTN–1942R TP1911FW
S058	EVQQS607T	SWITCH CTN–1942R TP1911FW
TRANSFORMERS		
T001	**TLP16297**	**TRANSFORMER, POWER SUPPLY**
T501	**ETH19Y70AY**	**TRANSFORMER, HORIZONTAL DRIVER**
T502	**ETE19Z30AY**	**TRANSFORMER, HORIZONTAL COUPLING**
T551	**TLF15615F**	**TRANSFORMER, FLYBACK**
CRYSTALS/FILTERS		
X001	TSS2077MX	CRYSTAL, OSCILLATOR
X101	EFCH45MVK12N	SAW FILTER
X102	EFCS4R5MW3BA	4.5MHZ TRAP
X201	EFCS4R5MS4	FILTER 4.5MHZ BANDPASS
X501	EF0A503KS41	CRYSTAL, OSCILLATOR
X601	TSS816MX	CRYSTAL 3.58MHZ OSCILLATOR

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
OTHERS		
M001	**A48JJY81X**	**CRT 19"** **PC–20X56R QC–20F21R**
M002	EAS12D516KG	SPEAKER, 3" X 5" 16 OHM CTN–1955R CTN–1956R PC–20X56R
M003	EAS16D300T	SPEAKER, 2" X 6" 14 0HM CTN–1942R TP1911FW
M004	EAS9D528K–G	SPEAKER, 2" X 3–1/2" 16 OHM QC–20F21R TP1921FE
M005	ENV568C4G3	U/V TUNER TP1921FE
M006	ENV568C5G3	U/V TUNER QC–20F21R
M007	ENV568C6G3	U/V TUNER CTN–1942R TP1911FW
M008	ENV568C7G3	U/V TUNER PC–20X56R
M009	ENV56897G3	U/V TUNER CTN–1955R CTN–1956R
M010	ETC–33X8NA	YOKE, CONVERGENCE CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
M011	EUR641035	TRANSMITTER, REMOTE CONTROL TP1911FW
M012	EUR641036	TRANSMITTER, REMOTE CONTROL CTN–1955R CTN–1956R PC–20X56R
M013	EUR641037	TRANSMITTER, REMOTE CONTROL QC–20F21R TP1921FE
M014	EUR641241	TRANSMITTER, REMOTE CONTROL CTN–1942R
M015	TBM170179	OVERLAY: CHNL/PWR/VOL CTN–1955R CTN–1956R PC–20X56R
M016	TBM173024–1	BADGE, PANASONIC CTN–1942R CTN–1955R CTN–1956R PC–20X56R
M017	TBM17454–2	NAMEPLATE: QUASAR QC–20F21R TP1911FW TP1921FE
M018	TBM2A22902	OVERLAY: " MENU/TV VIDEO" CTN–1955R CTN–1956R PC–20X56R
M019	TBX2A51901	ASSY. 7 PUSHBUTTON QC–20F21R TP1921FE
M020	TEK6935	DOOR, CATCH CTN–1955R CTN–1956R PC–20X56R
M021	TES2A20305	SPRING, DAG GROUND
M022	THE492–4	SCREW, CRT MTG. CTN–1942R CTN–1955R CTN–1956R QC–20F21R TP1911FW
M023	THT1009R	SCREW, CRT MTG. PC–20X56R
M024	TJB1724600M	1RF ANTENNA TERMINAL: COMPLETE CTN–1942R CTN–1955R PC–20X56R TP1911FW
M025	TJB17624	A/V INPUT TERMINALS CTN–1955R CTN–1956R PC–20X56R QC–20F21R TP1921FE
M026	TJB2A20601	ANTENNA CONVERTER 75–300 OHM
M027	TJC6319	FUSE HOLDER
M028	TJS1A5050	CRT SOCKET
M029	TKP1756976	GRILLE, SPEAKER TP1911FW
M030	TKP1756977	GRILLE, SPEAKER CTN–1942R
M031	TKP1757881	GRILLE, SPEAKER CTN–1955R CTN–1956R PC–20X56R
M032	TKP1811831M	DOOR, CONTROL CTN–1955R CTN–1956R PC–20X56R
M033	TKP1811842	OVERLAY: "MONITOR/RECEIVER" CTN–1955R CTN–1956R PC–20X56R
M034	TKP2A11001	OVERLAY: INFRA–RED QC–20F21R TP1921FE
M035	TKP2A51001	GRILLE, SPEAKER QC–20F21R TP1921FE
M036	TKP2717847	OVERLAY: "MENU" CTN–1942R
M037	TKP2717848	OVERLAY: "MENU/ON TIMER" TP1911FW
M038	TMM2A10803	SPACER, LED QC–20F21R TP1921FE
M039	TMM2A30201	WEDGE, DEFLECTION YOKE
M040	TMM2A910	SPACER, LED TP1911FW
M041	TMM27513	WASHER, RUBBER: CRT MTG.
M042	TNQ2682	RECEIVER, REMOTE CONTROL QC–20F21R TP1921FE
M043	TNQ2683	RECEIVER, REMOTE CONTROL CTN–1942R CTN–1955R CTN–1956R PC–20X56R TP1911FW
M044	TPC184813	PKG. REGULAR SLTD CARTON CTN–1942R
M045	TPC2A10051–1	PKG. REGULAR SLTD CARTON TP1911FW
M046	TPC2A10082–2	PKG. REGULAR SLTD CARTON PC–20X56R
M047	TPC2A10083	PKG. REGULAR SLTD CARTON CTN–1955R CTN–1956R
M048	TPC2A10402	PKG. REGULAR SLTD CARTON QC–20F21R
M049	TPC2A10401	PKG. REGULAR SLTD CARTON TP1921FE
M050	TQB2A0546	MANUAL, OWNERS' CTN–1955R CTN–1956R
M051	TQB2A0557	MANUAL, OWNERS' CTN–1942R
M052	TQB2A0559	MANUAL, OWNERS' PC–20X56R
M053	TQB2A0602	MANUAL, OWNERS' TP1921FE
M054	TQB2A0603	MANUAL, OWNERS' QC–20F21R
M055	TQB2A0604	MANUAL, OWNERS' TP1911FW
M056	TSA120024	VHF ANTENNA
M057	**TSX3134X**	**AC LINE CORD**
M058	TXFBX038SER	ASSY. 5 PUSHBUTTON: CHNL/PWR/VOL CTN–1942R TP1911FW
M059	TXFKU061SER	ASSY. CABINET BACK TP1921FE
M060	TXFKU071SER	ASSY. CABINET BACK QC–20F21R
M061	TXFKU427SER	ASSY. CABINET BACK TP1911FW
M062	TXFKU448SER	ASSY. CABINET BACK CTN–1942R
M063	TXFKU480SER	ASSY. CABINET BACK CTN–1955R CTN–1956R
M064	TXFKU610SER	ASSY. CABINET BACK PC–20X56R
M065	TXFKY061SER	ASSY. CABINET FRONT CTN–1955R

REPLACEMENT PARTS LIST

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

Ref. No.	Part No.	Description
M066	TXFKY071SER	ASSY. CABINET FRONT PC–20X56R
M067	TXFKY191SER	ASSY. CABINET FRONT TP1921FE
M068	TXFKY201SER	ASSY. CABINET FRONT TP1911FW
M069	TXFKY211SER	ASSY. CABINET FRONT CTN–1942R
M070	TXFKY291SER	ASSY. CABINET FRONT QC–20F21R
M071	TXFKY860SER	ASSY. CABINET FRONT CTN–1956R
M072	TXFMK01H55	CONVERGENCE CORRECTOR STRIP PC–20X56R QC–20F21R
M073	TXF3A01SBTM	ASSY. DAG GROUND
M074	T8A262	SILICONE GREASE–HEAT SINK COMPOUND
M075	UR64EC978	BATTERY COVER: TRANSMITTER
M076	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE
M077	**51GGB95X**	**CRT 19" CTN–1942R CTN–1955R CTN–1956R TP1911FW TP1921FE**

Ref. No.	Part No.	Description

ABBREVIATION OF PART NAME AND DESCRIPTION

RESISTOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Carbon	F	+/– 1%
F	Fuse	J	+/– 5%
M	Metal Oxide	K	+/– 10%
S	Solid	M	+/– 20%
W	Wire Wound	G	+/– 2%

Part No. Description

Example: ERD25TJ104 (C) 100KΩ (J) 1/4W

CAPACITOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Ceramic	C	+/– 0.25pF
E	Electrolytic	D	+/– 0.5pF
P	Polyester	F	+/– 1pF
S	Styrol	J	+/– 5%
T	Tantalum	K	+/– 10%
		L	+/– 15%
		M	+/– 20%
		P	+100% –0%
		Z	+80% –20%

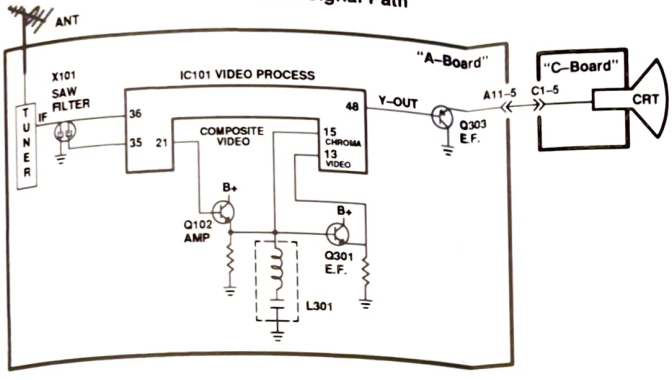
Part No. Description

Example: ECKF1H103ZF (C) 0.01µF (Z) 50V

Block Diagrams

(CTN–1942R, TP1911FW)

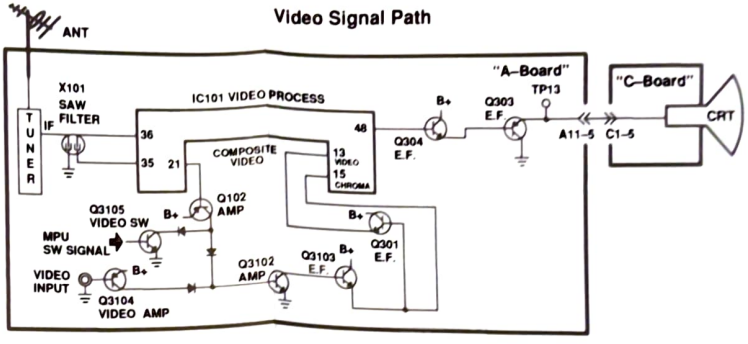
Video Signal Path



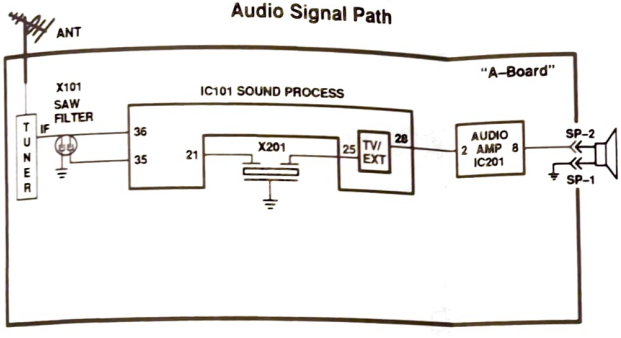
Block Diagrams

(CTN–1955R, CTN–1956R, TP1921FE, PC–20X56R, QC–20F21R)

Video Signal Path



Audio Signal Path



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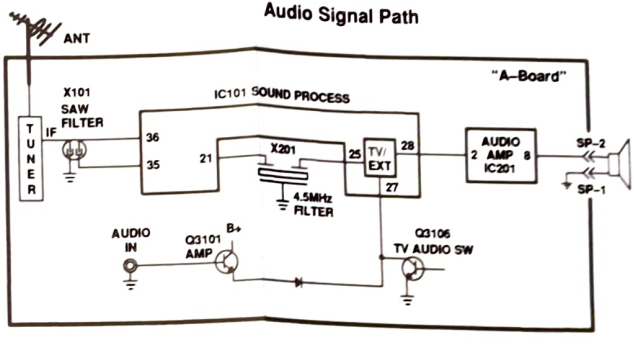
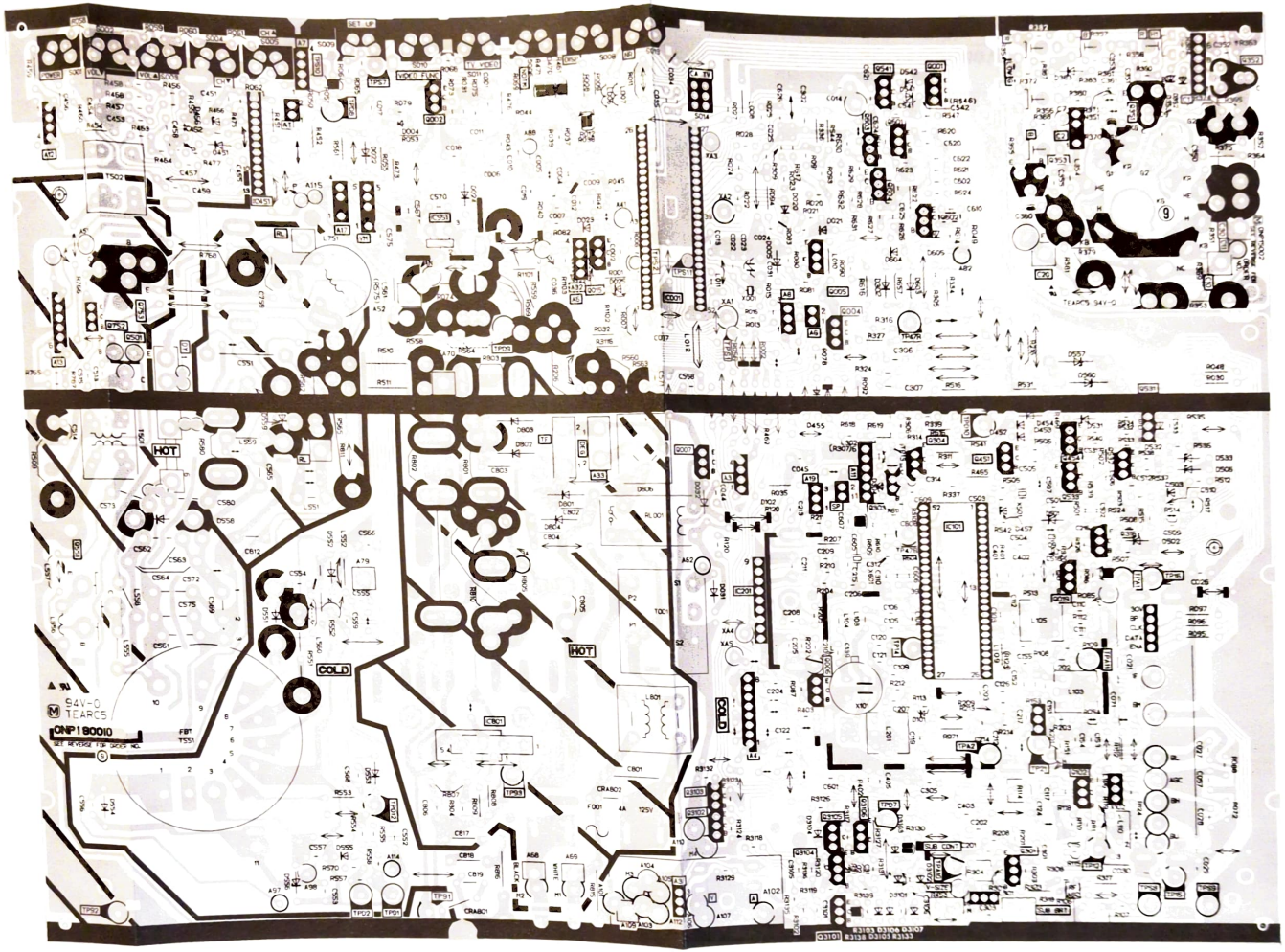


A–Board ONP190010

C–Board ONP15002



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